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THE LARGER HELMINTHS IN THE INTESTINES OF DOMESTIC ANIMALS; THEIR ASSOCIATION WITH DISEASE, AND METHODS OF CONTROL*

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In choosing this subject for my address to you this evening, I was guided mainly by the questions asked me at the demonstration given here early in the year. At that time there were on view specimens of the worms commonly met with in the domestic animals of this country; I thought, therefore, that this occasion would be a good opportunity of discussing these parasites and their association with disease.

It must be borne in mind that I am confining myself to those helminths which we can see readily. There are numerous other worms, difficult to see except by employing certain technique; some of these are more pathogenic than those with which I shall be dealing, but to keep my paper within limits I have had to omit them.

When making a *post-mortem* examination in an endeavour to find the cause of death, sometimes no abnormality is found other than the presence of a number of helminths, with the result that there may be a tendency to conclude that worms were responsible; but how many animals are entirely free from worms? It is the rule rather than the exception for farm animals to harbour some helminth parasites and which are regarded as normal inhabitants of the intestines. Our problem is to determine the presence of disease, not merely the presence of parasites. The presence of eggs may demonstrate the presence of worms but not of helminthiasis. On the other hand, we may take it that parasitism as the cause of death holds a very high place in our list of diseases. These facts make it the more important that we should be in a position to recognise the common and usual worms affecting domestic animals, where they occur, how they live and how their numbers can be kept within reasonable limits.

To eradicate worms completely is out of the question; our main endeavour should be to limit their intake so that disease is not set up. In order to achieve this we must know the habits of the worms, particularly while they are outside their hosts, and if I dwell somewhat on this aspect it is for that reason. The recent outstanding work done by Taylor in Weybridge has thrown a new light on this aspect and has considerably advanced our knowledge in this direction.

The domestic animals I mean to deal with are horses, cattle, sheep and pigs.

*Presented to the Veterinary Medical Association of Ireland, at Dublin, November 29th, 1939. The paper was accompanied by diagrams and photographs, projected by the epidiascope, illustrating the life cycles and microscopic appearance of the eggs of the worms dealt with.

Pig

I propose to start with the pig. Strange as it may seem, this animal is a host for comparatively few species of worms, but as some of these are transmissible to man, the question of parasites in the pig is of importance from the public health point of view, and apart from the actual mortality caused by worms, the loss of condition and difficulties in rearing young pigs resulting from parasitism is a big problem to breeders and a source of great economic loss.

The first large worm we are likely to see in the alimentary canal is the *Ascaris lumbricoides*, which normally lives in the small intestine, but may be found in the stomach, large intestines and even in the bile duct; it may be found in large numbers—over 200 have been counted from a pig carcase between six and nine months old.

It has been estimated in Queensland, New Zealand[16], that in young pigs from two-and-a-half to five months old about 50 per cent. are infested, from four to five months old over 36 per cent., from six to nine months old about 19 per cent. and in those over two years old as few as 4 per cent.

The mature female is the most prolific of parasites and can lay 200,000 eggs per day which are passed out in the faeces but are not yet capable of infecting pigs for at least ten days or longer; low temperatures may prolong the development up to several months.

The eggs do not hatch out on the ground and are particularly resistant, being capable of withstanding freezing and most chemicals. Taylor[25] records that Ascaris eggs were still alive in a cold room after eight-and-a-half years; but hot dry conditions with plenty of sunlight can kill them in a few hours. High temperatures such as are met with in the centre of a manure heap will kill them in a few minutes, and prolonged exposure in urine and covered urine-soaked earth is fatal to the eggs in 24 hours.

During the course of their migration in the body of the pig, the young larvae pass through the lungs and it is here that they are particularly troublesome to their host: they rupture the capillary blood vessels in their efforts to get out into the alveoli, and in doing so cause numerous small haemorrhages into the alveoli and much damage to lung tissue. The effect of this, apart from the haemorrhage, is that the damaged lung tissue is exposed to bacterial invasion, and it is this which causes the pneumonia so commonly found in young pigs affected with these worms. This condition in the lungs may occur, therefore, a week or so after the eggs were swallowed.

Unless present in large numbers, the adult worms do very little damage except of a mechanical nature. If Ascarids are in large numbers, they may occlude the intestine or the bile duct and cause harm in this way. It has been shown also that should they die in the intestine and disintegrate there they are definitely harmful, so I think we can take it that most of the damage is done by the migrating larvae, that is before the eggs will appear in the droppings. Consequently, apart from smears or swabs taken from the pharynx we are not able to detect the presence of these worms during their most harmful period in the living animal.

Pigs up to five months old suffer most—those which recover from an infestation are retarded in growth and do not reach a saleable weight till they are comparatively old; this is attributed to destruction in liver and lung tissues and to the production of a toxaemia by the migrating larvae.

Ascariasis may best be combated by preventing the ingestion of the worm eggs, for no drug has yet been discovered which will kill the migrating larvae of intestinal worms. It is the young pigs, up to five months old, of which we have to be particularly careful, for after this age pigs are better able to withstand infestations with this parasite. Our difficulties are aggravated by :—

(1) The occurrence of pre-natal infestation, (2) the enormous number of eggs laid daily by each female and (3) the great resistance and longevity of the eggs.

Time permits me to give only an outline of control measures against this disease, and I look forward to hearing your views and experiences in this matter. The scheme devised by Ransom in America and called "The MacLean County Swine Sanitation System," has proved the most satisfactory. Briefly, it is as follows :—

1. Medicinal treatment of all sows a suitable time before farrowing—oil of chenopodium in castor oil administered after fasting is regarded as highly efficient.

2. Just before farrowing the sow is washed and scrubbed all over, so as to remove any adherent worm eggs. The sow is then placed in a thoroughly clean pen with a concrete floor.

3. Within ten days after farrowing, *i.e.*, before any eggs will have developed to the infective stage, the sow and litter are carted to a clean field. After weaning the sow is removed and the young pigs are left by themselves to grow up safely.

I have gone into more detail about this parasite than I will have time for with the others, but where the habits of these are similar we can use this description as a guide.

Ascaris lumbricoides is the only worm we are likely to see in the small intestine of the pig. Pigs do not harbour adult tape worms, though they make up for this by being host for the intermediate or bladder worm stages; but these are situated outside the intestines.

Passing downwards we come to the caecum where we are likely to see the whipworm, *Trichuris trichiura*.

The habits of this worm resemble those of Ascaris only in its development outside the body. Like Ascaris eggs they are very resistant and do not hatch out until they are swallowed by a suitable host such as man and pig, but the larvae which are liberated do not migrate through the body, they remain throughout the rest of their lives in the intestine, reaching maturity in about four or five weeks. These worms apparently feed on the body juices of the host, but are not considered very pathogenic, and unless in enormous numbers do not bring about ill-health. Occasionally they may produce an acute or chronic inflammation of the intestines.

Control of these parasites is based on the same principles as for Ascaris worms but pre-natal infestation does not occur. Medicinal treatment is unsatisfactory as we do not know of any efficient drug for their removal.

In the colon the only other easily seen worm is the nodular worm or *Oesophagostomum dentatum*. I do not know what the incidence of this worm is in this country but investigators elsewhere state that about 20 per cent. of pigs are infested. It is less than half-an-inch long and whitish in colour. This worm is closely related to the small red worms or Cylicostomes of the horse whose habits are somewhat similar.

Here again the eggs are passed out in the droppings, and on the ground they hatch out very quickly—within 24 hours; the young larvae are quite active but very resistant, and reach the infective stage in about a week and in this stage are even more resistant.

When infective larvae are swallowed by a pig, they enter the mucosa of the intestine where they form nodules. After a little over a month here the larvae return into the intestine where they become adult, and we may expect to find eggs in the faeces two months after the first infestation.

What damage do these worms cause? We have seen how the larval forms cause small nodules, but, unless in large numbers, these do not cause any marked disturbance to the pig though they render the intestines useless for sausage casings. With regard to the adult worms—Wetzel[28] in 1934, found that the Oesophagostomes of pigs and of sheep also, do not appear to fasten themselves very firmly to the intestinal mucous membrane when feeding, but they do produce a chronic inflammation around the point of attachment; this inflammation appears to be brought about chiefly by a secretion from the head-glands of the worms; and the worm feeds on the inflammatory products. If in large numbers then they may cause marked symptoms, the animal becoming unthrifty, thin, anaemic, with diarrhoea and ultimately death supervening.

Drugs do not help us much in treating this condition—the worms are too far back in the intestine. Hexylresorcinol has produced the best results so far, and enemata with copper sulphate solutions are said to give good results. The best line of attack lies in prevention with a good system of sanitation and hygiene.

These are the only helminths we are likely to see readily in the intestines of pigs in this country, and the general methods of control may be summarised as follows: Good housing, good drainage and good feeding. The sties should at least have a concrete floor which can more easily be kept clean. Faeces should be removed daily and, if used for fertilising purposes, should be spread out on fields immediately, but such pastures must not be used by pigs for at least a number of years. If this cannot be done, it is advisable to bury the droppings under one foot of soil; this has an added advantage in preventing flies breeding in them. The floors of the sties should be scrubbed out with boiling water and washing soda every ten days in summer and longer in winter. Moisture is necessary for the development of worm

larvae, so good drainage must be provided and the ground maintained as dry as possible. Food should not be thrown on the ground but placed in troughs, preferably of concrete, which are constructed in such a way as to prevent pigs lying in them. Young pigs should be weaned as soon as possible and kept on clean ground until they are at least five months old.

Ruminants

Now let us consider cattle and sheep. We are all too well aware of the losses experienced by farmers, particularly sheep farmers, from parasitic infestations in these animals, and yet it is amazing the numbers of helminth parasites which can be tolerated in animals ; they may be in thousands or tens of thousands before symptoms of disease are shown, so that we have to be careful before pronouncing parasites as the cause of death.

Parasites in the rumen have so far not been recorded in this country, but Craig and Davies[3] in 1937, and previously Pillers, reported having found in sheep in Cheshire that very small (about ¼ inch long) pink trematode or " conical fluke "—the *Paramphistomum cervi*—attached to the wall of the rumen, particularly in the anterior portion between the papillae, also in the reticulum and abomasum. They are found commonly in Africa in sheep and cattle. These flukes outside the body undergo development somewhat similar to that of the liver fluke, *Fasciola hepatica*, in that they live in species of snails, but when the cercariae are swallowed the immature flukes enter the intestines, where they attach themselves to the mucosa and cause considerable damage, resulting in a haemorrhagic and necrotic enteritis together with other systemic changes. After about two months in the intestine they migrate forward to their permanent home in the rumen and reticulum. Of the pathogenicity of the adult parasites we know very little.

Before proceeding further, may I remind you that we are dealing only with those worms which are easily visible to the naked eye. There are many pathogenic species occurring in the fourth stomach and small intestine and which are too small to detect readily with the naked eye, so we must pass them by, even though they are the chief cause of parasitic gastritis in this country.

I will refer but briefly to a well-known and easily distinguished worm found in the fourth stomach, the *Haemonchus contortus*, more popularly known as the " Twisted Wire Worm." It is not commonly found in this country but Lewis[8] stated he found it in 13 per cent. of sheep in Wales. It is only young animals, cattle up to two-and-a-half years and sheep up to nine months old, that are affected by it ; lambs under seven weeks old are not susceptible. The importance of these worms lies in their blood-sucking propensities ; they live on blood and produce anaemia in sheep ; this anaemia has been shown experimentally by several writers[1 5] to be similar to that caused by bleeding from the jugular vein.

The next worm we come to is not difficult to identify. It is found in the small intestine as the long, white ribbon-like cestode, the Moniezia, of which there are two species, *viz.*, *Moniezia expansa*, the commoner one, and *Moniezia benedeni*. Until last year the life history of none of the tapeworms of ruminants, or of the horse, was known, but Stunkard[21] in 1937, found the cysticercoid of the *Moniezia expansa* in the body cavity of a species of mite, and when a yearling wether swallowed such an infected mite and was killed 14 days afterwards, a specimen of *M. expansa* was recovered from its intestines. These worms may be each several yards long and so numerous as to fill a bucket. Robertson reports that they are very commonly seen in young lambs in Scotland, as many as 30 per cent. to 40 per cent. being infested, especially during late spring and early summer and again late in September.

It is difficult to associate this worm with disease in this country. It has been stated that all cestodes require large amounts of calcium, and heavily-infested animals may suffer from a calcium deficiency. In Rhodesia[20] and the U.S.S.R.[14 22] where up to 73 per cent. of sheep are infested, they are considered as one of the most pathogenic helminths, causing symptoms and even death in calves and lambs ; but as Taylor[26] points out, it is difficult to connect these parasites with disease since they are sometimes seen in large numbers in fat lambs, unless it be mechanical through obstruction or something of that sort.

The next worm we are likely to see is found in the small intestine, usually in the jejunum. It is perhaps not so readily distinguished as the others, but as it is one of the commonest worms found in lambs between three and six months old, I do not like to pass it over. It is called Nematodirus, of which there may be two species, indistinguishable from each other except microscopically. They are up to one inch long, white or sometimes reddish in colour and threadlike, with one end invariably twisted up on itself. This worm lays very large eggs which are readily distinguished on a microscopic examination of the faeces.

These worms are regarded as of low pathogenicity ; 3,000 were present in a healthy young bovine slaughtered and passed fit for human consumption[17], but they are apparently blood suckers.

At the posterior part of the small intestine, in the region of the jejunum and ileum, we are likely to find hookworms, the blood sucking Bunostomes, the species in cattle, *Bunostomum phlebotomum*, being as far as we know, distinct and not interchangeable with the *Bunostomum trigonocephalum* of sheep. They are up to one inch long and reddish in colour. It is estimated that about 50 per cent. of sheep, particularly adults, are infested but usually only with a small number. Robertson[18] found them occurring in Scotland, more commonly in September and October. Again the life cycle is direct. Animals become infested by swallowing the infective larvae, but they can also become infested by the larvae penetrating the skin ; in these latter cases the larvae are carried in the blood stream through the heart and lungs, and eventually reach the intestines to join their fellow larvae which arrived there direct.

In this country these worms are not regarded as very pathogenic ; this may be because they do not occur in very large numbers, but they are tissue feeders and blood suckers and in other countries, where the infestation is much higher, serious losses due to anaemia and death are experienced. Ortlepp[13] found that the drug most effective for the removal of these worms is chemically pure tetrachlorethylene —in doses of 5 c.c. for lambs and 7·5 c.c. for animals over nine months old—given mixed with one or two parts liquid paraffin immediately after administering 10 c.c. of a 2 per cent. copper sulphate solution. He also reported that alarming but transitory symptoms of giddiness and tympany may appear, but they

disappeared in 24 hours. It would be advisable, therefore, to dose only a few sheep first and see what happens before dosing the whole flock.

This brings us to the caecum, where we are likely to find the whipworm, *Trichuris ovis*, found very commonly but in small numbers in both sheep and cattle. It is claimed that over 70 per cent. of sheep harbour this worm and that it is the most common worm met with in this animal. It resembles the whipworm in the pig but it is larger and does not occur in man. The characteristic eggs enable us to identify the presence of the worms in the living animal and the life cycle is the same as that in the pig.

Up to recently these worms have not been regarded as very pathogenic, but Robertson[18], in his survey of the helminths of sheep in Scotland, stated that the *Trichuris ovis* can no longer be regarded as of no pathogenic importance. We counted 52 of these worms from the caecum of a young lamb which had died quickly from parasitic pneumonia. A large area of the caecal mucosa to which these worms were attached was highly congested, but numerous other worms were present throughout the alimentary tract.

In the colon we may find two different kinds of worms which can be readily seen : one the Oesophagostome, rather like that in the pig, and the other, a very common worm, nearly as common as the whipworm, the *Chabertia ovina*. Both kinds are related to the red worms of the horse.

Let us consider the Oesophagostome first. In cattle it is called the *Bosicola rediatus* and is rather rare in this country, and in sheep there is a different species called the *Oesophagostomum venulosum*, which Lewis[8] (1930) stated he found in 51 per cent. of sheep examined in Mid-West Wales in 1927-1928. There is another species in sheep, the *Oesophagostomum columbianum*, fortunately not found in this country but occurring commonly in Africa and Australia where it is known as " The Nodular Worm." It causes great losses in young sheep and lambs in those countries. This particular species has been shown to produce a specific intoxication in the host during both larval and adult stages.

The pathogenic effects are produced in the same way as in the pig, though cattle do not as a rule suffer from them, but the presence of these nodules renders the intestines unsuitable for the manufacture of sausage casings. Roberts[17], of Queensland, reports that he found 1,566 of these worms in the intestine of a healthy yearling bovine.

The other worm in the colon, the *Chabertia ovina*, is not unlike the Oesophagostomes in appearance ; it is white and stout but has a large head which is slightly bent. We usually find them attached to the mucosa of the colon which may be swollen, congested and covered with mucus if many worms are present. It has been stated that these worms tend to be the most prevalent species in sheep during the winter months[12]. The eggs are not characteristic so we cannot distinguish them on faecal examination. Infestation is acquired by ingesting the infective larvae and as far as is known no migration through the body takes place.

According to Wetzel[29] these worms are tissue feeders, sucking blood only by accident, but owing to the large size of their mouths they can suck in quite a large plug of mucosa, and when this portion of mucosa is digested by the worm it leaves that spot and moves on to another fresh area. In this way, in heavy infestations, a considerable portion of intestine may be damaged. A severe and persistent enteritis, therefore, may occur about four weeks after ingestion of the larvae and which may last from four to eight weeks. In severe infestations death may result. Robertson[18] tells us that 60 or more of these worms may produce symptoms.

Monnig[10] (1938) states that the drug which gives best results in the treatment of this condition in sheep is carbon tetrachloride, in doses of 3 to 4 c.c., given as for fluke disease, but he also states that tetrachlorethylene is safer and effective.

In concluding this section, I might call attention to the all-important factor of the *extent* of infestation in the cause of disease. In a pamphlet published by the Department of Agriculture, Australia (1938), the following numbers of worms considered necessary to cause disease are given : *Haemonchus contortus* —over 1,000 present were considered serious. Medium stomach worms—from 8,000 to 10,000 were necessary to cause death. Small intestinal worms—10,000 to 20,000 must be present to cause death. Large mouthed worms—200 to 300 were considered a heavy infestation. What applies in Australia may not, of course, hold good here but the figures are worth remembering.

We must next consider the enormous number of eggs laid and the ease with which pastures are infested, particularly when they are overcrowded. Taylor[25] tells us that a healthy sheep carrying worms may pass some 200,000 to 400,000 eggs daily, and a diseased sheep up to thirty million eggs per day. He also tells us that a healthy horse lightly infested may pass one to two million eggs daily and a diseased horse over fifty millions.

I will now outline some of the methods which have proved beneficial.

1. Feed well. An extra ration of concentrates renders animals, especially sheep, much less liable to attacks of parasites and in certain circumstances is in itself sufficient to prevent development of disease.

2. Dose regularly with suitable, safe and efficient anthelmintics. This will deal with the adult egg-producing worms.

3. Avoid overcrowding and employ pasture rotation. The amount of herbage plays an important part in the control ; the longer the grass the more dilute is the larval worm population and so fewer worms are taken in, whereas poor short herbage tends to increase the number of worms ingested. Pasture rotation permits grazing on clean pastures at intervals and allows the old grazing to rest, during which worm larvae die and the grass grows.

4. Adopt mixed grazing. Unsuitable hosts will ingest and kill off large numbers of larvae. Taylor states that a single horse would destroy from 50,000 to 100,000 trichostrongylid larvae of ruminants per day on a heavily-infested pasture.

5. Dispose of manure from housed animals. In the U.S.S.R. it is claimed that horse manure mixed with cow and sheep manure will hasten the fermentation process and so kill the worm eggs and larvae more quickly[23].

Horse

This brings us to the horse. This animal, like the sheep, is never entirely free from worms. Of the diseases in young horses, it is claimed that parasitic enteritis constitutes the greatest single source of loss to horse owners and the greatest cause of inefficiency.

The only large worm occurring in the small intestine is the *Ascaris equorum*; it is like the *Ascaris lumbricoides* in the pig but is much larger and has a very distinct head. It may be up to 20 inches long but usually is much shorter. This worm is very commonly met with in foals and methods of control are on similar lines to those outlined for the pig, but in the treatment, oil of chenopodium is not so effective. The treatment as recommended by Slatter and Graham[24] (U.S.A.) is carbon bisulphide—6 drams per 1,000 lb. body weight, given in capsule or absorbed in magnesium carbonate, or by stomach tube after previous fasting. Food and water are withheld for five hours after treatment. Vanni[27] (1938) recommends the administration of calcium on account of the calcium deficiency brought about by these worms.

In the caecum of the horse we find the tape worm *Anoplocephala perfoliata* which averages about two inches long and is greyish-white or cream coloured. These worms are most commonly found attached to the mucosa around the ileo-caecal valve, but they may also be present in the ileum or anywhere in the caecum. Sometimes they are seen in large numbers; Robertson[19] counted 325 in a Shetland pony under four years old which had died from parasitic enteritis.

The eggs are characteristic and easily identified, but nothing is known so far of the life cycle of the tapeworms in equines. These worms possess large suckers by which they attach themselves to the mucous membrane; if they remain attached to the one spot for some time they cause inflammation and even serious ulcers around the point of attachment; but if they change their position frequently ulcer formation is usually absent. They have been known to cause rupture of the caecum. Their presence can often be diagnosed by the appearance of fresh blood on the surface of the formed faeces.

Another species of this tapeworm, called the *Anoplocephala mamillana* is fairly common and resembles the *Anoplocephala perfoliata* but is smaller. It is found in the small intestine and occasionally in the stomach but it is easily overlooked and has been mistaken for small pieces of fat. It appears to be harmless.

We now come to the most important and most pathogenic of all the helminths of horses, the so-called "Red Worms" or Sclerostomes. They are found both in the caecum and colon and may be present in thousands. As there are more than 40 species, I shall divide them into two groups, the Strongylus or large worms, and the Cylicostomes or smaller worms, and deal with each group collectively.

The eggs of all the Sclerostomes bear a close resemblance to one another so that we cannot distinguish the species of worm from the appearance of the egg. Their development on the ground, in both groups, is somewhat similar to the Strongylid worms of ruminants and calls for no further description.

In the infective stage, they are particularly resistant, much more so than those of the ruminant worms. Under favourable conditions of temperature and moisture they may remain alive for years, although Taylor[25] has shown that in the first month or so a large proportion of them die.

The infective larvae are taken into the body in the food or water, and by various means and routes, depending upon the species, they become adult in the large intestine. In the Strongylus this takes about twelve weeks although according to Britton[2] maximum egg production is not reached for about five months. The Cylicostomes develop much more quickly.

Time does not permit a description of the various routes taken by the larvae, but in the case of the Strongylus group it is generally accepted that they migrate through the body *via* the blood or lymph stream, at least, as far as the lungs, but how they get back to the intestines from the lungs is still debatable. Wetzel and Enigk[30] (1938) were unable to find the larvae in the trachea and oesophagus up to 98 days after artificial inoculation with larvae. Fourth stage larvae and immature adults are found in various parts of the body. We are familiar with them in the aneurisms of the anterior mesenteric artery and its branches, in about 90 per cent. of horses. These so-called aneurisms are caused by the presence of the immature *Strongylus vulgaris*. Aneurisms have been frequently blamed for causing colic, but in Germany only 2·8 per cent. of colics could be ascribed to worms, and in South Africa where verminous aneurisms are very common, colic is rare.

In the case of *Strongylus edentatus*, immature forms are often found in nodules about the size of a nut which may be very numerous and crowded together in the right ventral colon and caecum. An immature worm lies in the centre of each nodule whch communicates with the lumen of the bowel through a small opening, and through which the worm returns to complete its development. Larvae have also been found free in the abdominal cavity, under the parietal peritoneum, in the liver and the perirenal fat.

Development of the Cylicostomes appears to take place without migration but the immature forms of several species penetrate into the mucosa or submucosa and develop there, forming nodules or cysts which may be so numerous that it is almost impossible to stick a pin into the mucous membrane without touching them. These cause such irritation to the bowel wall that it becomes thickened and unable to function properly.

Let us now see how the adults behave. They certainly are numerous, especially those of the smaller species. The Strongylus and some of the Cylicostomes suck blood. One species in particular prefers to feed along the course of the dorsal colic artery in the right dorsal colon and may be found in hundreds with their heads buried in the extensive ulcers caused by them. Those worms which are not blood suckers may feed on tissue or on intestinal contents. We hear much about adult worms producing toxins but this is a subject of much controversy. Monnig[11] (1937) stated that helminths do not produce toxins apart from their normal and necessary secretions and that their excretions are not of much importance in this connection. The greatest degree of apparent toxicity appears to be found where there is external digestion and where a large proportion of the digestive enzyme is lost by the parasite and absorbed by the host.

There is just one more worm of the horse I must mention—the *Oxyuris equi*, which is a cause of pruritus ani These worms live in the colon and are easily

recognised. The young females are white with short pointed tails, and the mature females are brownish or slate grey in colour, up to six inches long and with very long tails. The eggs are characteristic and readily distinguished by their shape. They are covered with a sticky substance and are laid in clusters which adhere to the skin in the perineal region; they can readily be seen as cream-coloured masses in this region and it is their presence here which is the cause of the pruritus. A scraping taken from here and examined under the microscope readily reveals the eggs.

These eggs do not hatch out but develop to the infective stage in about three days when they fall to the ground to be swallowed by a passing host. In a suitable host—equines—development takes about four months, but only the final larval stage does any damage as in this stage they are tissue feeders: the adults feed on intestinal contents and, apart from the presence of the eggs, cause no harm.

Before considering the question of control of helminths in equines, I should like to review some of the facts concerning these parasites on the ground. We have been duly impressed by the resistance of the mature eggs, when the embryos inside them are developed and ready to hatch out. We have noted also the resistance and longevity of the infective larvae, but that bright sunlight and dessication have a lethal effect upon them. They can resist the action of most chemicals under field-conditions. Leiper[9] showed that, of the numerous chemicals experimented with, calcium cyanamide, applied to pastures at the rate of 6 cwt. per acre, has given the best results so far; he found that it destroyed 70 per cent. of the larvae in the grass but only 47 per cent. of them in the undergrowth.

We have seen that the conditions which favour the spread of helminthiasis among animals at pasture can briefly be summarised under the following heads: (1) Overcrowded pastures. (2) The length of grass—animals pick up more larvae on short grass than on long grass. (3) Young animals are more susceptible than adults—experiments carried out in Germany in 1930 showed that a rapid fall in degree of worm infestation occurred in horses after four years old and that from six to seven years up to ten years old the infestation remained practically constant.

The methods of control I have outlined for helminths in ruminants apply equally to those of equines and I will repeat them in their application to horses:—

(*a*) For horses at grass: (1) Feed well. (2) Avoid overcrowded conditions of grazing. (3) Provide mixed grazing. Sheep are especially useful in this direction. (4) Arrange rotation of grazing. (5) When possible rest the pasture and turn it into hay. (6) Give periodic dosing with suitable anthelmintics. The mares should be dosed before being taken with their foals to clean pastures. For Strongylid worms, oil of chenopodium is claimed by many to have given the best results so far, especially when administered by the stomach tube, but this drug is contraindicated in inflammatory conditions of the alimentary tract, in debility, in pregnancy and is dangerous in very young animals. Harwood and others[6] (1938) claim very good results with N-butyl chloride and reported that it was 99 per cent. to 100 per cent. effective against Cylicostomes and 74 per cent. to 100 per cent. effective against Strongylus in the animals they treated with a dose of 0·1 c.c. per lb. body weight given in eight to ten times its volume in linseed oil after 18 to 24 hours' fast.

(*b*) For horses in stables, manure control is the key to prevention.

1. Keep the stables clean and dry. Remember that larvae can climb up the damp walls and infest the food. Dry walls thoroughly lime-washed are effective in dealing with this danger.

2. Remove the faeces promptly and regularly. If the faeces are spread out and allowed to dry in the sun within 40 hours of having been passed, the larvae do not develop. The manure should be subjected to heat by packing tightly in manure heaps; the heat of fermentation in the centre will kill all eggs and larvae; the outsides of such heaps should be sprayed with suitable chemicals. Another method which is claimed to be effective is to mix thoroughly one part of urea with 125 parts of fresh faeces and allow to stand for a week. Parnell[15] has shown that the larvae are killed when the faeces are soaked with horse urine.

3. Do not feed the animals from the ground. All food and water should be given from raised feed boxes, hay racks and water troughs; this prevents their contact with the bedding or faeces which contain worm eggs and larvae.

4. Provide fresh bedding frequently.

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References

[1]Andrews, J. S. (1938). "Haemorrhage as the Cause of the Fatal Anaemia Associated with Stomach Worm Infection in Sheep. U.S. Bureau of Anim. Indust. *J. Parasit.* **24.** (Dec. Suppl.): 6, 17-18.

[2]Britton, J. W. (1938). "Studies on the normal variations in the strongyle egg counts of horse faeces." *Cornell Vet.* **28** (3). 228-239.

[3]Craig, J. F., and Davies, G. O. (1937). "*Paramphistomum cervi* in sheep." *Vet. Rec.* **49.** 1116.

[4]Dinnik, J. A., and Dinnik, N. N. (1937). "Influence de la température, de l'absence d'oxygène et du dessèchement sur les oeufs de *Trichocephalus trichiurus* (L.)." *Med. Parasitol.* **6** (5). 603-617. (Abstract in *Helm. Absts.* **6** (5). 192-193.

[5]Fourie, P. J. J. (1931). "The Haematology of Haemonchosis in sheep." 17th Rep. Direct. Vet. Ser. & Anim. Indust. Union of S. Africa. Part I. 495-572.

[6]Harwood, P. D., Underwood, P. C., and Schaffer, J. M. (1938). "Treatment of equine strongylidosis with n-butyl chloride. (Preliminary Note.)" *N. Amer. Vet.* **19** (7). 44-46. (Abstract in *Vet. Rec.* **51.** 786.)

[7]Harwood, P. D., Jerstad, A. C., and Swanson, E. (1938). "The efficacy of Phenothiazine for the removal of Ascarids and Nodular worms from swine." U.S. Bureau of Anim. Indust. *J. Parasit.* **24.** (*Dec. Suppl.*): 6, 16.

[8]Lewis, E. A. (1930). "An account of a survey of the Parasitic Helminths of some domestic animals in Mid-West Wales." *J. Helminth.* **8.** 1-18.

[9]Leiper, J. W. G. (1937). "On the value of various chemical substances as a means of destroying infective larvae of horse sclerostomes in the field." *J. Helminth.* **15** (3). 153-166.

[10]Monnig, H. O. (1938). Veterinary Helminthology and Entomology.

[11]———. (1937). "Helminth Toxins." (Abstract in *Helm. Absts.* **6.** 5, 246.)

[12]Morgan, D. O., and Oldham, J. N. (1934). "Further observations on the effect of heavy stocking on the worm burden under a system of Rotational Grazing." *J. Helminth.* **12.** 177-182.

[13]Ortlepp, R. J. (1935). "The sheep hookworm. Its appearance, life-cycle, control and remedial measures." *Farming in S. Africa*, X (106), 10-11. (Abstract in *Helm. Absts.* **4.** 3, 93.)

[14]Panova, L. G. (1937). "Tapeworms of sheep in Leningrad region." (Abstract in *Helm. Absts.* **6.** 5, 257.)
[15]Parnell, I. W. (1934). "Some methods of controlling the spreading of internal parasites of the horse." *Sci. Agric.* **15** (3). 165-168. (Abstract in *Helm. Absts.* **3.** 5, 178.)
[16]Roberts, F. H. S. (1934). "*Ascaris lumbricoides.* Its life history in Queensland, economic importance and control."
[17]———. (1939). "The occurrence and prevalence of Gastro-intestinal helminths in apparently healthy cattle in Queensland, Australia." *J. comp. Path.* **52** (2). 160-165.
[18]Robertson, D. (1937). "The parasitic helminths of sheep in Scotland." *C. R. Congrès (XIIe) Int. Zool.* **3.** Lisbonne. 1935. **3.** 2013-2043.
[19]———. (1939). "Intestinal parasites of Shetland ponies in the north of Scotland." *Vet. Rec.* **51.** 779-781.
[20]Le Roux, P. L. (1932). "Notes on more important worms of cattle, sheep and pigs." Ann. Bull. Dept. Anim. Health, N. Rhodesia. 9-24.
[21]Stunkard, H. W. (1937). "The life cycle of *Moniezia expansa.*" *Science.* **86.** (2231), 312.
[22]Skrjabine, K. I. (1932). "Prevention of the helminthiases of sheep by treatment as practised in the Soviet Union." *Bull. Off. internat. Epiz.* **6.** 155-172.
[23]———, and Schulz, R. E. (1933). "Prevention of Fascioliasis and of Strongylidosis of sheep and cattle." *Bull. Off. internat. Epiz.* **7.** 1935-1936.
[24]Slatter, E. C., and Graham, R. (1933). "Horse parasite control in Illinois." *Vet. Bull. U.S. Army.* **27.** 21-28.
[25]Taylor, E. L. (1938). "Observations on the Bionomics of Strongyloid Larvae in Pastures." *Vet. Rec.* **50.** 1265-1272.
[26]———. (1935). "The Association between gastro-intestinal helminths and disease in ruminants." *Vet. Rec.* **32.** 915-919.
[27]Vanni, V. (1938). *Riv. Parassitol.* **2.** (3). 219-232. (Abstract in *Helm. Absts.* **7.** 4, 159.)
[28]Wetzel, R. (1934). "The nutrition and pathogenic action of Oesophagostomes." *Deuts. tierärztl. Wschr.* **42.** 602-603.
[29]———. (1931). "The feeding habits and pathogenic action of *Chabertia ovina.*" *N. Amer. Vet.* **9.** 25-28.
[30]———, and Enigk, K. (1938). "Wandern die Larven der Palisadenwürmer (*Strongylus* spec.) der Pferde durch die Lungen?" *Arch. Wiss. Prakt. Tierheilk.* **73** (2). 83-93.

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Discussion

Professor T. G. Browne opened the discussion in the following terms: So far as I am aware this is the first occasion on which a paper on this subject has been presented to this Association. I think you will agree with me that this is a most important subject from the point of view of our profession. Up to the present it has been very much neglected in this country so that there is now considerable scope for its advance and development. Some considerable number of years ago—in the late Professor Mettam's time—Professor Craig did a considerable amount of good work on the study of parasites, but from that time, until Mr. Sleith came on to the staff of the Veterinary College, no one in this country has had the opportunity to specialise in parasitology. From Mr. Sleith's paper and from what I know of his enthusiasm for this work I think we can safely conclude that we have now the right man in the right place. He has dealt with the subject thoroughly and efficiently and I find it very difficult, as opener of the discussion, to offer criticisms, because his statements are particularly well guarded and supported by facts. The only point perhaps on which I am not quite in agreement with him is where he referred to suitable, safe and efficient anthelmintics in the treatment of ruminants for parasites in the alimentary canal. I am not aware of any drug which will fulfil that rôle, except in the case of the wire worm and to a lesser extent some of the trichostrongyles. If we had efficient drugs for all worms in the alimentary canal we would be in a much happier position than we are. I might state that in drenching ruminants a small quantity of copper sulphate solution should be administered immediately before the drench in order to stimulate closure of the oesophageal groove, so that the drug will be carried directly to the abomasum.

I think I cannot do better under the circumstances than merely amplify Mr. Sleith's paper by elaborating what I consider the most important aspect of his remarks, namely, the factors which influence infestation of animals with parasitic nematode worms acquired at pasture. Mr. Sleith mentioned many interesting points in connection with pasture infection, which time did not permit him to elaborate, so that I shall merely make an attempt to enlarge on what Mr. Sleith has said.

I may state at the outset that most of the knowledge which we now possess regarding pasture infection is based on the recent brilliant work of Taylor in England.

It is well known that wild animals in their natural habitat do not suffer from worm diseases. The primordial state was one of harmonious community of happy worms in happy animals but man deranged the natural order of things by upsetting the balance of nature. He fenced in the animals he had domesticated to prevent them from wandering, with the result that their choice of pasture was restricted, and the level of parasitic infestation was raised above the degree of tolerance consistent with nature's balance as between parasite and host. Parasitic disease is as harmful to the parasite as to the host, since it often results in the destruction of both. So long as the number of worms in an animal remains reasonably and naturally small the harmonious relationship continues. As Mr. Sleith has told us to-night, it is well known that perfectly healthy animals may harbour relatively large numbers of parasitic worms in the alimentary canal. In my own experience in the dissecting room the great majority of aged horses reveal aneurism of the anterior mesenteric artery or occasionally of the iliac arteries, as a result of worm infestation of the intestines; yet these animals have lived long hard-working lives.

Increase in nematode parasites is essentially linked with progress in the improvement of pastures and the consequent increase in number of grazing animals, so that the artificial readjustment, of the balance between grazing animals and their parasites, looms very largely in the practical problems of animal production. This readjustment will come only through a detailed knowledge of the reactions of the parasites, both during their free life in the pastures and during their parasitic life in the animal. For the proper understanding of the development of worm diseases there are three important points which require special consideration.

1. The inability of parasitic worms to multiply in the body of their host.

2. The longevity and the almost ubiquitous distribution of the infective larvae in the herbage.

3. The remarkable egg-producing powers of the female worms.

The inability of parasitic worms to multiply in the body of their host constitutes an important peculiarity in the propagation of worm diseases, as compared with diseases caused by bacteria and protozoa which are capable of

multiplication within the body of the animal in which they are living. Every individual worm, of the tens of thousands that may be present in an animal, must have been picked up from outside, as from the pasture. The environment of the grazing animal, therefore, largely governs the increase of these parasites, and this is a factor of paramount importance which clearly indicates that our course of action, in our attempt to eradicate parasitic diseases, should be directed towards the reduction of the infective larvae (or in some cases the eggs) on the pasture. These larvae, however, are endowed with great powers of resistance against chemical agents, cold, dryness or other adverse forces acting upon them, since they are ensheathed in a second outer skin as the result of moulting. They are able to survive for an inconveniently long time in the herbage; patience may be said to be one of their vices, for some of them can wait twelve months or even as much as two years in exceptional cases for a passing host. This resistance of the larvae, combined with the remarkable egg-producing powers of the adult worms, gives rise to ample opportunity for the transmission of large numbers of worms under crowded conditions of animals. This fact will be better appreciated when it is realised that a diseased sheep, infested with trichostrongyles, may pass from 9,000,000 to 30,000,000 eggs daily, and a diseased horse infested with strongyloid worms may pass over 50,000,000 eggs daily. The egg production of some parasitic worms is numbered in tens of thousands daily per individual female.

In view of the longevity and resistance of the larvae and of the enormous output of eggs, even by healthy animals, the evil effects of overcrowding animals on pasture will be readily appreciated. It is clear that the more animals are put on to a field the more eggs will be disseminated and the more infective larvae will be picked up. Furthermore, the rate of increase is actually even greater than it appears, because there is a tendency for the parasites to increase as the square of the number of animals per unit area. For example, if the number of animals per unit area be trebled, each animal will then be exposed to three times the previous risks of infection and will, therefore, carry approximately three times the previous number of parasites, with the result that the risks of contamination of the unit area of pasture will be, not three times, but nine times greater than before.

With all these forces in favour of numerical increase of parasites one may well ask by what miracle our animals ever escape parasitic disease? There are several factors which decide whether disease will develop or not in any given animal or flock or herd. The most important of these is the level of the immunity or resistance in the animal or animals, but there are many other factors operating which have a restraining influence on the multiplication of the parasites, such as dryness or degree of moisture, frost or cold, amount of herbage, type of herbage, character of the soil, the effects of drugs, treatment of the land, effects of haymaking, ploughing, effects of resting the pasture or of grazing by other species of animals. These factors influence the development of the larvae, the longevity of the larvae, their rate of disappearance and the rate of their intake by the host animals.

A considerable amount of work has recently been carried out by Taylor on the question of immunity of the host animals and it was found that a relatively strong resistance develops about the time that the animal reaches maturity after which most of the infective larvae that are picked up are unable to develop. This resistance, however, is not absolute and may break down if the animal is under-nourished, or is on a diet which is deficient in some constituent or is suffering from some intercurrent disease, or as a result of an excessively high rate of intake of the infective larvae of the parasites. This immunity of adult animals is of considerable importance, because, if it did not exist, it would be quite impossible to maintain animals, in a state of health, in anything like the crowded conditions which prevail everywhere on reasonably good pasture at the present time.

Parasitic worms of the same species are not known to vary in virulence but a lowering of the resistance of the host may be brought about, as just mentioned, by any factor which reduces the animal's vitality.

The longevity of the infective larvae on the pasture and their rate of disappearance are obviously of first importance in making recommendations for control. The questions most frequently asked by the owner refer to the duration of infection in the field and how to kill the larvae there. Important observations recently carried out by Taylor have shown that the death of some of the strongyloid and trichostrongyloid larvae begins almost as soon as the infective stage is reached, and the diminution of the infective larvae proceeds at a more or less constant and rapid rate for some four or five months, by which time about three quarters of the larvae on the herbage are dead; the rate of mortality then becomes slower and the remaining larvae do not entirely disappear for another three or four months, or even longer. Further observations suggest that the long-lived larvae are those which, because of mechanical obstruction to their upward migration on the grass, are kept near the surface of the soil, where, even in the dryest weather, there is a moist microclimate favourable to their prolonged existence. The most lethal factor for infective larvae is exposure to conditions approaching absolute dryness, so that the larvae which climb high on to the grass have only a short life and may die within 24 hours from reaching the tip of the blade. From the practical aspect the important point is that larvae can retain their infectivity on arable land throughout the winter in sufficient numbers to cause disease in animals in the following spring.

The best means of bringing about a speedy diminution of the larvae on infected land, is to rest the pasture at intervals for at least several weeks at a time, so as to allow as many larvae as possible to die off; or better still have the land grazed by stock of a different species which cannot be infected by that particular parasite. The efficiency of grazing with the wrong host animals has been shown by Taylor, who demonstrated that each member of a flock of sheep placed on an infected horse paddock could collect and destroy some 60,000 to 90,000 infective red-worm larvae daily which might otherwise have remained to infect the horses. According to Taylor the same thing happens when resistant adult animals are grazed on infected pasture as where ewes and lambs are grazed together. He asserts that ewes, although they are responsible for the infection of the pasture in the first instance, do a great deal to limit the amount of infection available to the lambs by eating off and destroying the infective larvae. For example, he states that ten lambs grazed together on a certain area of ground are in greater danger of infection than five lambs grazed with five adult sheep on a similar area. This is based on the fact that the resistant healthy adult animals are capable of destroying a large proportion of the larvae which they take in, so that only a small percentage of these larvae reach maturity. If it can be proved that

healthy adult animals destroy more larvae than they produce, then it would appear to be sound policy to dilute, as it were, the numbers of young animals on a pasture by mixing them with a percentage of healthy adults.

The effect of different kinds of herbage upon the rate of intake of strongyloid larvae has been worked out by Taylor. He observed that a large number of the infective larvae of these worms, in endeavouring to ascend the growing shoots of grass, are obstructed by the divergent blades and by the sharp-edged collar that clasps the stem, at the junction of the leaf and sheath, in many species of grass. The larvae are, therefore, turned off along the under side of the lower leaves. In the case of clover, however, there is no obstacle of this nature to the upward progress of the larvae, so that here most of the larvae are found on the trifoliate part at the top of the petiole. The risks of infection from grazing on clover are, therefore, greater than on other grasses, and this has been demonstrated in Northumberland, where there was a campaign for improvement of the pastures by the application of basic slag. This dressing resulted in a considerable improvement in the pasture which should have reduced parasitic infestation by improving the health of the grazing sheep and by diluting the concentration of the larvae on the herbage; but the result was the contrary. Parasitic gastritis in the sheep increased far beyond what it was before the pasture improvement began. This was due to the fact that the basic slag led to a considerable increase of wild, white clover on the pasture with the result that the intake of infective larvae was increased.

It will be realised that, on grass, the concentration of larvae will increase on approaching the ground, so that the closer to the ground the animals graze the greater will be the intake of larvae. It will thus be obvious that animals on scanty pasture, grazing comparatively close to the ground, will pick up many more larvae than animals on a rich crop of grass. Furthermore, the animals on the scanty pasture will require to graze over a much greater area of infected ground in order to obtain the necessary amount of herbage, so that the risks of infection in such conditions are enormously increased. The migration of larvae up the stems of grass takes place when the grass is moist, chiefly with dew, so that infection is most likely to occur on dewy mornings.

The influence of the amount of herbage on the rate of intake of larvae has also been worked out by Taylor. He has shown that the herbage dilutes, as it were, the concentration of the larvae present, so that where there is a large amount of grass the number of larvae per pound is correspondingly low, but where grass is very scarce, as where there is overcrowding, or during times of drought, the number of larvae per pound will be high. A grazing animal under the latter conditions would have to collect its day's requirements from a large area of the field, grazing low to the ground, and, although the number of larvae per square yard may be approximately the same as on an area well covered with herbage, the number of larvae per pound of the short herbage is much higher and disease is more likely to result.

Patchiness of pasture is a factor which is more pronounced in hill pastures where, although there may be three or four acres of land per animal the herbage is patchy; the animals then concentrate on a few small areas, where overcrowding occurs, with a resulting increase in intake of worm larvae.

The effect of drought on the rate of intake of infection is of considerable importance. During dry hot weather the faeces lying on the top of the ground quickly become dry when larval development ceases. It was shown by Mönnig, however, that when the egg of a trichostrongylus has reached an advanced stage of development, and the embryo is just ready to hatch, it is very resistant to dryness. An accumulation of potentially infective material, therefore, occurs during a time of drought, since the faeces retain moisture long enough for many of the eggs to reach the stage in which they are resistant to dryness; dry conditions then check their further development, but they remain alive until moist weather conditions recur when they hatch. The larvae then proceed to grow to the infective stage and a mass development of third-stage infective larvae takes place. A critical time for pasture animals is, therefore, at the end of a period of drought, especially if the wet weather appears suddenly rather than in the nature of occasional showers.

Cold and frost have similar actions to those of drought inasmuch as they inhibit the development of the larvae, so that the accumulation of potential infection is followed by a mass development of infective larvae as soon as warmer weather conditions recur.

The stock owner usually associates wet pastures with parasitic-worm infestation. There is little doubt that this idea originates in the association between liver fluke and wet land which is essential, in that instance, for the development of the intermediate host (the snail). Investigations indicate that, so far as nematode infection is concerned, there is no reason to suppose that any significant difference exists between what would be called a dry pasture and a wet one. Our dry pastures are by no means to be regarded as safe from worm troubles.

The type of soil plays some part in nematode infection; thus sandy soil is more favourable for the development of the larvae than a finer clay soil. When the faeces of infected animals are trampled into the soil such as occurs where animals are much overcrowded on pastures, or in a pen, the conditions favourable for the development of larvae are very much increased.

The application of farmyard manure to pastures is undoubtedly one of the ways in which the infective larvae on a pasture may be increased, but this is probably of less importance than is generally believed as the conditions in a manure heap are most unfavourable for larval development. Larvae will persist only in the outer five or six inches of the heap, so that this portion of the manure should be discarded or utilised as the nucleus of a new heap.

Haymaking is doubtless very effective for the removal of larvae from infected land and ploughing is similarly very effective, perhaps, chiefly, because the land is allowed a period of rest. It has been found that larvae may persist in hay for as long as 18 months.

As to the application of heavy dressings to the land with the object of destroying the larvae, there does not appear to be much hope of success from this line of attack. It has been shown by Taylor that, in order to produce any appreciable effect, the dressings would require to be applied in such large quantities that the green herbage would be almost completely destroyed. The dressings which have been tried are quick lime, salt, copper sulphate, kainit and calcium cyanamide.

The control of worms by the use of cheap, safe, drugs administered to the animal is the means most favoured by farmers. This remedy, however, is not so generally effective as is often believed, because it is only in the case of a few species of worms that drugs have been definitely proved to be effective. Furthermore, drugs will act only on adult worms, having no effect at other

stages of development. However, this matter has been dealt with by Mr. Sleith in the paper and there is, therefore, no need for me to enlarge further upon it.

It will be obvious from what has been said that our chief method of attack against most parasitic diseases must be along preventative rather than curative lines, since the efficiency of drugs is limited and in some cases nil. All measures should be taken towards the reduction of the larvae on the pastures and the intake of larvae by the animals. In all cases the resistance of the animals should be maintained by good feeding, and they should not be kept on poor pastures, especially during drought.

I should like to close by making a few observations on diagnosis, because this is a matter of considerable interest to the practitioner.

Clinical symptoms are of comparatively little assistance in diagnosis of helminthiasis in grazing animals, being of a very undecided nature, and rarely more definite than gradual wasting, accompanied by an unhealthy condition of the skin, diarrhoea and anaemia which are also associated with several other conditions. We have a valuable aid, however, in the egg count of the faeces, but Taylor points out that this method has its limitations and should not be regarded as the beginning and end of diagnostic procedure, because there are several factors involved which may lead to entirely false impressions regarding the numbers of worms present.

1. The number of eggs in the faeces gives no indication of the numbers of immature parasites. It merely takes account of the female adult worms.

2. The variable nature of the intestinal contents and the rate at which they pass through the intestine will have a considerable influence on the egg count. Eggs passed by the worms are not diluted to the same extent when there is bowel stasis and the count per gramme of faeces may be increased as much as five or six times on this account. On the other hand a large amount of bulky food or the presence of diarrhoea has the reverse effect, diluting the concentration of the eggs and thus reducing the count as much as five or six times what it otherwise would be.

3. The age and general state of resistance of the animal may depress the egg-producing capacity of the female worms very considerably, and thus reduce the count to an unexpected degree.

4. There is a special difficulty in the horse where a large number of different species of worms are frequently associated with red-worm disease. These worms are of different sizes and doubtless of very different pathogenicity, yet they all lay eggs of the same shape and size which cannot be distinguished, so that an ordinary count does not reveal the exact nature of the infestation, which in one instance may be dangerous and in another of little consequence, in spite of similarity in the egg count.

It is obvious that the evidence obtained from the egg count is more reliable when the count has been carried out on a number of occasions from faeces passed at different times.

Post-mortem examinations give the most reliable evidence of parasitic disease in a herd or flock.

Again I wish to thank Mr. Sleith for his excellent paper.

Professor O'Dea, having complimented Mr. Sleith on his paper, said that the author had collected from the very wide field of veterinary parasitology material of the greatest practical importance to the practitioner and had presented the matter in a manner that had held the interest of the audience right through the discourse. Judging by the number of members present at the meeting much was expected and he was sure everybody was satisfied that he had received good value both in the address itself and in the able opening of the discussion by Professor Browne.

To the farming industry parasitic infestation was undoubtedly one of the greatest causes of loss among livestock both on account of unthriftiness and of deaths. Even apart from obvious pathological disturbance there was often present an undetermined sub-clinical condition of half health or lack of robust health which might make all the difference between a profitable and an unprofitable unit or between a high class and a middle class animal.

There was one criticism which he would like to make. Both Mr. Sleith and Professor Browne conveyed the impression that treatment of parasitic affections in general is unsatisfactory and that in order to maintain domesticated animals in a state of apparent health, we must concentrate on methods of control with a view to limiting infestation. While he entirely agreed that methods of control should be utilised as far as possible, he would point out that in Great Britain and Ireland under modern methods of husbandry every area of pasture land must for economic reasons carry a much larger number of animals than it hitherto supported. Consequently attempts to control infestation by starvation of larvae were, for the most part, impracticable. Mixed grazing could be carried out to only a limited extent because the proportion of equines or swine to ruminants on the average farmstead is low, while, as stated by Mr. Sleith, the interchange of cattle with sheep, in so far as macroscopic alimentary parasites and liver fluke are concerned, could have no effect in reducing incidence in either of these species. Further, the grazing of adult with young cattle on farms where diseases such as tuberculosis and contagious abortion exist was extremely unwise.

Facts of this nature confronted the practitioner constantly and he had to deal with them under conditions as they exist, which were usually different from those that obtain in South Africa or Canada.

Control could be practised in the case of valuable stud farms by regular collection and proper disposal of faeces from the pasture but in the case of the ordinary farm, where a percentage of the land is not arable or though arable not cultivated, means of control became very limited. Here we must have recourse to treatment, and removal of most of the macroscopic parasites mentioned was by suitable medication nowadays practicable. Against the *Fasciola hepatica* we had male fern and carbon tetrachloride; against those parasites causing gastro-enteritis in cattle and sheep they had found the copper sulphate plus nicotine sulphate mixture recommended by Mönnig efficient; against nematode worms affecting the alimentary tract of equines oil of chenopodium and other agents were effective. Any of these when given in suitable quantity after previous preparation of the subject need only be repeated every six or eight weeks. Regular dosing of all susceptible animals on a farm together with removal of the animals from the pasture while the medicament is operating would in the course of one or two years probably reduce contamination of land to a point well within the margin of safety while at the same time permitting the owner to enjoy the almost full use of its grazing capacities.

Any disease that was ineradicable or refractory to immunisation must be combated by treatment as well as prevention. Of late years parasitologists had done an immense amount of investigation into life histories, modes of prevention, etc. Although there was still work to be done along these lines one would venture to suggest that the abilities and energies of some research workers might now with advantage be directed towards the discovery of new medicaments and improved methods of treatment.

They would look forward with pleasure to another address by Mr. Sleith in the near future.

Mr. J. J. Collins, Department of Agriculture, said that he wished to make a few comments on Mr. Sleith's excellent paper from the practitioner's point of view.

It would not be doing the majority of practitioners an injustice to say that they were not very familiar with the names, life histories, and appearances of all the more common worm parasites of the larger domestic animals. For this lack of interest and knowledge in such an important subject, he thought the experts themselves were to blame. For instance, such people were officially known as Helminthologists—a nasty shock to one who desired to become better acquainted with their work—and on further perusal one found that apart from such words as parasites, larvae, and eggs which were easily understood, the worms themselves were given such names as *Nematodirus spathiger, Muellerius capillaris, Haemonchus contortus, Oesophagostomum dentatum, etc.* These were difficult to pronounce, more difficult to spell, and almost impossible for a busy practitioner to remember. Consequently they were not on speaking terms with a host of worms with which they would like to be familiar were it not for their awful names.

In the pig the commonest and best known worm was the *Ascaris lumbricoides*. When a farmer saw these worms in his sty, he would get in touch with his veterinary surgeon, and want to know whether the latter could cure them for him. The practitioner of course should say "yes," and advise the owner to clean and wash out his pig sties, give them fresh bedding, but no food for twelve hours before the proposed worming. Fortunately for the veterinarian, worms in these cases were generally very numerous, and after a properly given anthelminthic, such as chenopodium and castor oil, the owner was assured of a spectacular result. This put him in a receptive frame of mind for a little good advice on how to prevent a heavy re-infestation of his pigs, and he had found that surprisingly good results would follow if the animals were then well fed, not overcrowded, and the piggeries not only cleaned out daily for the following week, but washed out as well. Here might he say that it was very important to know how to worm a number of pigs quickly and efficiently. He found that if one had the assistance of an agile farm hand who could catch and hold the animal by the ears in a firm position between his legs it was a simple matter to give the medicine, using an ordinary iron table spoon. This was sufficiently strong to enable one to prize open the mouth if necessary, keep the lower jaw depressed, and withstand the animal's efforts to chew it up while the medicine was being given. In the past they had not considered as they should the possibility of intestinal worm infestation as the cause of such unthriftiness, scouring, and even death in calves and young cattle. He had seen six-months-old calves die of enteritis due to a heavy strongyle infestation. What he had said about calves and young cattle applied to sheep also. They, possibly because of the tendency to overcrowd them on pasture, were frequently heavily infected with the stomach Haemonchus, strongyles and trichostrongyles in the bowel. For these parasites the best form of treatment was a mixture of nicotine and copper sulphate, and it was well, too, to realise that sheep owners expected this form of treatment, thanks to the "Veterinary Notes" in various farmers' journals.

Horsey and hunting people of experience were well aware of the ravages caused by red worm infestation. Once they knew that a particular animal had shown clinical symptoms of this disease, *i.e.*, unthriftiness, pot belly, depraved appetite with periodic attacks of scouring when large numbers of small red worms could be seen in the faeces, they would avoid that animal, and those from the same owner or pasture, like the plague. For treating such animals he had found that a preparation (in capsular form) composed of carbon tetrachloride, Istin, and arsenous acid, was much more effective than chenopodium and oil. Here, of course, as in all worm parasitic conditions, steps must be taken to avoid re-infestation as far as possible.

Although the great majority of mature horses harboured some of the many varieties of the *S. vulgaris* in their alimentary canal, it was only occasionally that they became so numerous as to endanger the life of their host. In numbers that were well tolerated, however, their larvae often caused damage to the mesenteric arteries, and in some cases sudden deaths in horses had been found on *post-mortem* examination to be due to haemorrhage following rupture of the anterior mesenteric artery.

Mr. J. E. Kenny (Department of Agriculture), who complimented Mr. Sleith on his paper, said that the essayist had the privilege of specialising in his subject and had therefore many advantages over the worker who has many irons in the fire. He was very pleased that Mr. Sleith included as one item in his method of control, dosage at regular intervals with an anthelmintic of some known efficiency. It was, in his opinion, better to regard anthelmintics as of control rather than curative value. At the Veterinary Research Laboratory, Thorndale, during the period 1929-1931, a large number of drugs with recognised anthelmintic properties were tested for efficiency on housed sheep suffering from parasitic gastro-enteritis. In no case did their efforts succeed in completely ridding any sheep of all its parasitic worms. Judged by egg counts of samples of faeces, spectacular improvements were noted in a few cases, but these low egg counts were not maintained. As copper sulphate appeared to give results as good as, or even better than, any of the other anthelmintics used it was decided to carry out a small experiment to see if this drug had some control value.

The object of this experiment was to see if sheep exposed to infection by grazing on land known to be heavily infested with strongyles and trichostrongyles, and given 2 oz. of a 1 per cent. solution of copper sulphate at intervals of one month, had any greater resistance to infestation than control sheep grazing on the same pasture. Seven cross-bred Cheviot ewes were used in the experiment which commenced on November 18th, 1929, and was terminated on May 19th, 1931. Sheep numbers 257, 258 and 262 received the monthly dosage of the copper sulphate solution and sheep numbers 260, 261, 264 and 265 were left as controls. Two further sheep, numbers 248 and 249, showing the presence of fluke ova in their faeces throughout the entire period of the experiment were also grazed simultaneously on the same pasture. All the sheep were clipped before weighing at the conclusion of the experiment.

Increase in weight of each animal at end of experiment.

Sheep receiving monthly doses.

Sheep No. 257=41 lb. increase.
" " 258=41 " "
" " 262=37 " "

Control sheep.

Sheep No. 260=35 lb. increase.
" " 261=32 " "
" " 264=31 " "
" " 265=28 " "

Fluke infested sheep.

Sheep No. 248=14 lb. increase.
" " 249=No "

Admittedly the number of sheep in the experiment was small and the strength of the copper sulphate used rather low, but it was felt to be more than a coincidence that the sheep receiving monthly dosage all showed a greater increase in weight than the control sheep. The fact that the sheep with the added handicap of liver fluke disease showed no gain in weight in one case and an increase of only 14 lb. in the other gave some little idea of the wastage caused by worm infestations. Prof. Browne had suggested that the good result shown may have been due to the tonic effect of the copper sulphate rather than its anthelmintic value, but of course he (Mr. Kenny) could not say which was correct. If, however, the results obtained were confirmed by an experiment in which a larger number of sheep was used, the economic value of this very cheap drug and readily

carried out procedure might be more generally appreciated.

Mr. J. S. Cosgrove (Kildare) said that he wished, as one of the first of Mr. Sleith's students to be qualified, to be associated with the thanks expressed to Mr. Sleith on his excellent paper. Prof. Browne had already dealt with manure as a means of spreading worm parasites over land and suggested discarding the manure towards the outside of the heap in order to reduce the number of larvae in the manure. This was naturally a great economic loss and in order to overcome it the late Maurice Hall, of the American Department of Agriculture, recommended building manure pits with double walls with an air space between them and fitted with a wooden sheeted lid which when closed sealed the pit. The heat resulting from fermentation then became uniform throughout the manure and was sufficient to kill all parasitic larvae in about one week, thus rendering the manure safe for fertilising and spreading over land.

Mr. M. J. Byrne (Veterinary College of Ireland) said that great credit was due to Mr. Sleith for the very able manner in which he dealt with such a wide subject.

With regard to parasitic infestation of the digestive system Mr. Byrne remarked that this was not always accompanied by poor condition on the part of the host; in fact, animals throve during the initial stages of parasitic invasion, due apparently to an increased appetite. Farmers often made use of this fact by purchasing sheep which had been grazing on known "fluke free" pastures and transferring them to contaminated pastures—where, on picking up the parasites, they improved in condition for a short while—and then reselling them.

Referring to Mr. Collins' remarks with regard to oil of chenopodium in the treatment of strongylosis in horses, Mr. Byrne said that in his opinion oil of chenopodium was one of the most valuable anthelmintics for horses which we had at the moment. He also said that practitioners should advise their clients to dose all their horses twice yearly for worms and if this practice was carried out throughout the country we undoubtedly would have much more useful and better looking horses.

The Reply

Mr. Sleith said that they had paid him a great compliment in coming there that night in such numbers, especially when taking into consideration the prevailing conditions and the unfavourable weather. Many kind and some very flattering remarks had been made about him, but he wished to say that the credit for anything he had done must be shared by all the members of the College staff and by the many others who had supported and assisted him so readily and ably, and he wished to take that opportunity of thanking them for their co-operation.

The large attendance demonstrated in no small way the serious view held in regard to parasitic diseases, and it was hoped that his remarks might prove of some assistance to those who were dealing with these diseases in the field.

From the numerous questions raised he felt that many were disappointed because more had not been said about medicinal treatment. He had purposely avoided this aspect because, as the title of his paper showed, he wished to emphasise the other aspect of dealing with parasitic infestations, that of control and prevention. Treatment with anthelmintics should be considered only as a part of general treatment, a very important part no doubt, but it must not begin and end there. Medicinal treatment affected only isolated individuals and was generally applied only to those showing clinical symptoms; it left out the carrier animals which showed no clinical symptoms but were disseminating worm eggs in large numbers.

Many questions raised had already been dealt with by other speakers and as the time was getting late he would deal briefly with the remaining points.

He wished to thank Professor Browne for so ably opening the discussion, especially as he did so at short notice. With regard to his point concerning the treatment of ruminants—safe, suitable and efficient anthelmintics, where such were known, were effective in dealing only with certain adult worms, but, as Professor Browne had pointed out, we did not know of any drug which would remove all intestinal worms. This emphasised the point which he had endeavoured to make, that medicinal treatment was only partly effective in keeping down infestations on pastures.

Referring to the treatment of manure heaps, he would like to point out that instead of discarding the outer five or six inches of the heap, these outer layers could be periodically turned into the centre of the heap and so brought, with their contained eggs and larvae, under the influence of the heat of fermentation; or failing this, the outer layers of the heap should be regularly sprayed with creosote or paraffin.

Haymaking and ploughing were mainly effective in that the land was rested for a period, during which many, but not necessarily all the worm eggs and larvae died. It had been shown that larvae, after being ploughed into the soil, could work their way up to the surface again and remain alive for long periods, also that they could remain alive during hay making.

Dealing with the suggestion, made by Professor O'Dea, that medicinal treatment of all susceptible animals on a farm should be carried out every six or eight weeks for one or two years, Mr. Sleith said that this method would undoubtedly be beneficial, but on how many farms would it be carried out throughout that period? This method did not prevent the animals from becoming re-infested when they were returned to the already infested pastures, and unless they adopted some additional measures of control the worm population might not be sufficiently reduced to prevent disease. They must bear in mind that anthelmintics were, at present, only of limited value; they were only effective against certain parasites and did not remove the immature worms from the animal—also, they might be dangerous when used indiscriminately.

Mr. Collins' remarks on the treatments he had found successful were very interesting. With regard to the medicinal treatement of pigs, he (Mr. Sleith) said that a new drug called Phenothiazine was meeting with much success. It had been found very effective in dealing with Ascarids and certain other intestinal worms in the pig and could be given in the feed. The dose recommended by Harwood and others[7] (U.S.A.) was one gramme per kilo in four times its weight of feed and no preliminary preparation was necessary. He also described an instrument used to facilitate the administration of drugs to pigs.

The experiments described by Mr. Kenny were most interesting and instructive. It was not stated if daily worm egg counts from faecal examinations were made during the experiment. A comparison of the egg count in the treated and control animals would have been interesting, to show the effect of the copper sulphate, and might have indicated whether the action was of tonic or of anthelmintic value.

He welcomed the remarks from Mr. Cosgrove and congratulated him on his maiden speech at these meetings and hoped that more would be heard from him in the future. The manure pit described by him had proved very efficient in dealing with this problem. The efficient treatment of manure, particularly in housed animals where it was more practical in application, was the key to the solution of most parasitic problems.

In reply to Mr. Hynes, who stated that he preferred to use tonics containing arsenic, copper and other minerals instead of the usual anthelmintics, he would be interested to know if he had tried giving animals free access to mineral licks. Some people claimed very good results from these licks.

Mr. Byrne had stated that animals throve during the initial stages of parasitic invasion. While this was generally so in the case of fluke disease when the parasite first invaded the liver, he (Mr. Sleith) was not aware that such occurred in the case of intestinal parasites.

THE VETERINARY RECORD

April 13th, 1940.

THE PROGRESS OF PARASITOLOGY

THE able review of veterinary helminthology from the practitioner's standpoint that appears elsewhere in this issue is a pertinent reminder of the tremendous progress that has recently been made in the development of this branch of veterinary science.

Instructive comparisons between the development of parasitology and of the older science of bacteriology have previously appeared in the columns of the *Veterinary Record,* and it has been most interesting to watch the changing attentions of the parasitologists from one phase of their study to another. The first concern in this study, which developed along classical lines, was an enquiry into the morphology of the parasites; later came their systematic arrangement into groups, then their life histories and, last of all, the scientific investigation of their association with disease. This sequence, as exemplified in the progress of parasitology, represents the usual development of an applied science out of academic knowledge, and differs in a most interesting way from the growth of bacteriology which, as Topley has pointed out, is almost unique among the sciences in having developed its applied side first.

Mr. Sleith's paper, and the interesting discussion that followed, gives encouraging evidence of continued progress in the application of the science of parasitology towards a better understanding of the development of helminthic disease, and of its ultimate control in domesticated animals. We are familiar with the alliterative dictum created by Hall, that " permanent pastures perpetuate parasites " and from the knowledge of helminths on which it is based we may expect to find the diseases of grazing animals with which they are associated, to be of exceptional importance among the moist, rich grazing lands of Mr. Sleith's country.

Although the climatic conditions there, and the agricultural practices that accompany them, appear to indicate a fruitful field for the study of helminthic diseases, this has so far remained almost unexplored, but now that new interest has been aroused we look forward to further contributions that may add to our knowledge on the parasitism of animals in Eire.

Experimenting with rabbits, Remlinger and Bailly found that the virus of Aujeszky's disease is present almost invariably in the choroid of animals dying from the disease, but in only about half the cases in the retina. This is in contrast with rabies, in which exactly the converse is true. The diseases are similar in that in neither case is the virus present in the aqueous humour.—*Veterinary Medicine.*

CLINICAL COMMUNICATION

An Unusual Wound

P. ROBERT TURNER, M.R.C.V.S.
and
GORDON S. MASON, M.R.C.V.S.,
Bury St. Edmunds

The subject was a Suffolk mare, 15 years old, with a history of having been backed into a pointed iron bar (part of a farm waggon) about two days previously. Examination revealed a deep puncture wound about two inches in diameter immediately above the anus and exactly in the mid-line. Exploration of the wound showed that it was directed slightly downwards and that the metal bar had penetrated the rectum about six inches inside the anal rim, thus constituting what amounted to an anal fistula. There was, however, no evidence of faeces passing through the fistula.

Treatment.—As it was evident that any form of suturing was going to be a matter of some difficulty, the wound was dressed daily with a 1 in 1,000 acriflavine emulsion in liquid paraffin, in the hope that, provided faeces were not actually passing through the wound, granulation and healing might occur without suturing.

Three days later very little change was to be observed in the wound, although the tissues were more healthy looking—presumably the result of the acriflavine dressing.

After a further three days, it became quite obvious that healing could not possibly occur without some form of suturing, for by this time air and flatus was constantly psssing through the fistula, resulting in continuous movement of the granulating surfaces of the wound.

Operative Procedure.—Epidural anaesthesia was first induced by the injection of 30 c.c. of a 1 per cent. solution of tutocaine into the epidural space. Anaesthesia was complete in about ten to fifteen minutes, the animal remaining standing throughout the operation. A speculum was introduced into the rectum and dilated and it was then possible (with the aid of a light) to see the rent in the roof of the rectum : it was about one to one-and-a-half inches long. With the speculum still in position, a long needle-holder bearing a full-curved needle (its point being directed backwards towards the operator) threaded with stout silk was introduced through the speculum into the lumen of the rectum and the needle inserted upwards and backwards into the far side of the rectal wound, being then withdrawn *via* the fistula. To complete the other half of the suture the needle was re-inserted *via* the fistula and pierced the rectal wound opposite to the puncture first made. It was now possible to tie off the suture *via* the rectal opening. Three sutures were inserted in this way to effect closure of the rectal tear, and finally a modified type of purse string suture, inserted as deeply into the tissues as possible, was employed to bring the edges of the wound into closer apposition.

Soon after the completion of operation the mare went down in a straw yard (the effect of the epidural anaesthesia) but was able to get up within ten minutes.

The mare has been seen twice since operation at intervals of one week ; healing is now almost complete and the animal back at work. Sutures were removed two weeks after operation.

ABSTRACTS

[TREATMENT OF TETANUS IN THE HORSE WITH GLUCOSE. (Trans. title.) Vögele. (1939.) *Z. Veterinärk.* **51**. 279-284.]

The author believes that on general economic grounds, and also because of its uncertain curative action, antiserum treatment is often precluded in cases of equine tetanus. Active immunisation with tetanus toxoid, while undoubtedly effective, is scarcely practicable in army horses on account of the cost in comparison with the low incidence of the disease. His interest has therefore centred around non-specific therapy and attempts have been made to discover the best methods of treatment. Details are given of a severe attack of tetanus in a service horse following a foot injury. The muscles of the neck, back, loins, and quarters were stretched and hard as boards. In the first three days of the illness 300,000 units of tetanus antitoxin were administered, but without apparent effect. On the fourth day 100 c.c. of a 50 per cent. glucose solution and 20 c.c. of a 25 per cent. solution of magnesium sulphate were given intravenously, and despite the animal's weak condition, an improvement was noted in a few hours. Later four litres of milk, one pound of sugar and five teaspoonfuls of calcium chlorate were administered by stomach tube. This treatment was repeated the day following, using smaller doses, and heart stimulants were applied. After four days there was a marked improvement in the condition of the muscles; the glucose and magnesium sulphate treatment was therefore continued for eleven days. Three weeks after the onset of tetanus the horse was completely free from tetanic cramp and fed normally. While admitting that one swallow does not necessarily indicate summer, the author was impressed with the result obtained, which he suggests might be due to the specific action of the sugar on the nervous system.

W. L. S.

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[I.—RECENT PROGRESS IN CANINE ORTHOPAEDIC SURGERY. Schroeder, E. F.
II.—SOME ORTHOPAEDIC PROBLEMS. Stader, O. (1939.) *N. Amer. Vet.* **20**. 54-66.]

Both these papers deal mainly with the application of a reduction and fixation splint, evolved by Stader for the treatment of the more difficult types of fractures in the dog, *e.g.* femoral and humeral fractures. This splint consists of an adjustable metal rod, placed externally, which clamps together stainless steel pins inserted into both fragments. Both authors have found that, if complete asepsis is observed, this is a very successful method, ensuring perfect coaptation and immobilisation of the fragments, especially in femoral fractures, and occasioning no discomfort to the animal. They claim that the irritation caused by the pins promotes the healing process in the bone.

Schroeder described in detail the application of this splint in fracture of the head of the femur. In this type of case he also immobilised the leg in a modified Thomas's extension splint. It is claimed that complete recovery occurs, even in cases where the fracture is intra-articular.

Stader described the use of the splint in the cure of fractures when no union has occurred and a "false joint" has formed. It is necessary in these cases to curette the bone surfaces to promote healing. He emphasises the difficulty in cases where the limb has become shortened and advises gradually extending the limb in a Thomas's splint by about $\frac{1}{16}$th inch per day, and similarly separating the fragments by the adjustable screws on his splint.

Both authors pay tribute to the value of radiography in the diagnosis of fractures, and in the observation of the healing processes after application of the splint.

J. W. D.

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[REMOVAL OF THE AFTERBIRTH IN THE COW. (Trans. title.) Götze. 1939.) *Deuts. tierärztl. Wschr.* **7**. 105-6.]

In a recent case a veterinary surgeon was called in to remove the membranes from a 32-litre cow. The surgeon removed some of the membranes, and later the remainder came away, putrid. The milk supply dropped to 1 litre, but beyond eating little food, the cow did not appear to show any visible symptoms of disease. The herd owner, reporting these facts to the author, wants to know if the putrifying afterbirth may be the cause of the diminution of the milk supply.

Götze replies that in all probability the cow, if ailing prior to calving, was already infected, but that she may have been infected due to handling during calving. Such an infection would pass along into the uterus. Normally the afterbirth should be passed out in from six to eight hours after calving, with no ill effects to the cow. In other cases there may be difficulty in passing the membranes owing to contraction of the organs. The animal may appear healthy after calving, as in the case quoted, but in three or four days' time, or even later, the infected uterus gives rise to symptoms of disease.

Owing to varying circumstances attending each case, it is impossible to give any specific treatment, and many veterinary surgeons now prefer to use pessaries, etc., rather than remove the membranes themselves. It is not possible to say exactly to what the trouble in the cow mentioned was due without an actual examination of the animal. Hygienic precautions at and after calving can prevent such infections.

D. J. A.

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[OESTRUS-INHIBITING EFFECTS OF INANITION. Mulinos, M. G., Pomerantz, L., Smelser, J., and Kurzrok, R. *Proc. Soc. Exp. Biol. Med. N.Y.* **40**. 79-83 (1 tab., 17 refs.).]

The effects of starvation upon the oestral cycle of rats were studied. Seven groups of five rats were used. Two groups received no food or water, one group water only, one group food and water intermittently, and one group was maintained as a control. It was found that the animals of all experimental groups eventually showed complete inhibition of the oestrus cycle, and that the inhibition was directly related to the loss in body weight. Further experiments failed to reveal any more specific cause of the anoestrus than inanition, and in all cases oestrus activity was resumed when the lost weight was regained.

D. D. O.

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[REMOUNT BREEDING AND BREEDING DISEASE DATA. Report. *Vet. Bull. U.S. Army.* **33**. 303-305 (1 plate.).]

A number of valuable statistics regarding horse breeding during the season 1938-39 are set out During the period 197 mares were bred. Of these, 157

conceived, and produced 140 living foals (73 per cent.) Seventeen mares aborted, one because of twin pregnancy, three from a *Strept. genitalium* infection, and one because of an abnormality of the foetus. The cause of the remaining twelve cases of abortion could not be determined, but none was due to infectious disease. Four foals died within 30 days of birth ; one from dilation of the stomach, two from pyosepticaemia neonatorum, and the other from some indeterminate cause. Only one mare died as a direct result of parturition. The cause of death was rupture of the uterine artery.

Nineteen stallions were used, and 135 of the mares were bred by natural cover only. In 60 cases natural cover was supplemented by artificial insemination, and in two cases the latter method was used alone. Pregnancy was diagnosed on the average 65 days after conception by clinical examination, and in 40 days by biological means. The average gestation period was 340 days, and colts were castrated on the average at eight months three weeks old.

D. D. O.

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[TREATMENT OF ISSUE HORSESHOES. Report. *Vet. Bull. U.S. Army.* **33**. 330.]

War Department Circular 55, Sect. 1 (July 28th, 1939) describes the use of borium for increasing the wearing qualities of horseshoes and preventing slipping. Borium is a form of tungsten carbide, and is supplied as acetylene tube borium or electric tube borium. The former type is of much greater utility. A mechanic with acetylene welding equipment can treat a shoe in about five minutes, and 1 lb. of borium is sufficient for 12 to 15 shoes. Treated shoes hold well on any hard surface road, and wear considerably longer than untreated ones.

D. D. O.

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[AVERAGE PRICES PAID FOR HORSES AND MULES, FISCAL YEAR, 1939. War Department Circular No. 54. *Vet. Bull. U.S. Army.* **33**. 338.]

The average prices paid for horses and mules by the United States army during the year ending June 30th, 1939, were : Riding horses, 163 dollars ; light riding horses, 100 dollars ; light draft horses, 165 dollars ; draft mules, 208 dollars ; pack and riding mules, 198 dollars.

D. D. O.

There was a surprise at Oldham Health Committee when the Chief Sanitary Inspector alleged that illicit slaughtering is going on in the out districts. The slaughterhouses in the borough are under good control, and inspection is easy, but because of the control system there is more killing than formerly as the needs of the out districts have to be catered for. The police have been asked to keep a watch on farmers who slaughter their own meat, and the Area Officer for Meat Supplies has been informed.—*Meat Trades Journal.*

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The Imperial Council of Agricultural Research in Delhi is considering methods for improving the breeds of camels, of which it is claimed there are 1,100,000 in India. The main breeding centres are in the Punjab, Sind, Baluchistan, and the Rajputana States. The camel is of great economic importance to the Indian cultivators and of use to the Defence Department in war-time.—*The Times.*

REPORT

[UNITED PROVINCES, INDIA. Report of the Civil Veterinary Department for the Year 1938-39 (T. J. Egan). Superintendent, Printing and Stationery, Allahabad, United Provinces, India. Price 6 annas.]

The veterinary staff consisted of a Director, three circle Superintendents, one Veterinary Investigation Officer and 221 subordinates. Mr. Muhammad Tahir Mirza, Superintendent, retired during the year and there were ten casualty vacancies among subordinates which do not appear to have been filled.

Disease.—There was an increase in the mortality from contagious disease, rinderpest and haemorrhagic septicaemia being mainly responsible. Four cases of glanders were detected in two districts. Surra in equines and camels was less rife. Inoculations against rinderpest were widely undertaken, mainly by the method of tissue virus. Experiments were carried out with chloroformed and unchloroformed goat tissue virus by the scarification method. It is reported that this method is simple and that the results are encouraging. Experimental work in this connection was carried out at the Central Laboratory in addition to routine examinations. Other interesting experimental work was also conducted.

There was a considerable increase in the number of animals treated at the veterinary hospitals and on tour, as also in the number of scrub bulls emasculated by scientific methods of castration. Four hospitals and one dispensary were opened during the year.

Breeding Operations.—The number of bulls approved for service was 429 compared with 352 in the previous year and 86 buffaloes against 99. The number of horse stallions employed was 57 (last year 56) and the number of donkey stallions nine (last year ten). It is stated that the progeny of the stallions is showing improvement as evidenced at the different horse fairs and shows held during the year. Thirty-five important cattle and horse fairs were attended by officers of the department.

The department took over the control and improvement of livestock work from the Agricultural Department in five districts during the year.

G. K. W.

DUAL-PURPOSE CATTLE

Captain Alan Richardson, presiding at the annual meeting of the Red Poll Cattle Society, said that gratifying evidence of the greater demand for Red Polls was seen in the formation of new herds in ten counties in various parts of England during the last few months, while in addition there had been a greatly improved trade for Red Poll bulls for cross breeding. Now that imported feeding stuffs were scarce, and in view of the greater need of food for stock being raised in this country, it was almost inevitable that more dual-purpose cattle like Red Polls would have to bred and kept. Numerous inquiries had been received from South Africa, but trade with this country was at a standstill owing to the quarantine station difficulties. He hoped that the Government would recognise that it was necessary to give every facility for carrying on the oversea trade in livestock.

The Duke of Grafton was elected President and Mr. J. Egerton Quested, whose herd of Red Polls existed at Cheriton, in Kent, 40 years ago, was made President-Elect.

N.V.M.A. DIVISIONAL REPORT

Veterinary Medical Association of Ireland*

MEETING IN DUBLIN

The November General Meeting of the Veterinary Medical Association of Ireland was held at the Veterinary College of Ireland, Ballsbridge, Dublin, on the evening of Wednesday, November 29th, 1939.

The following members were present: The President (Mr. J. J. Condon), Messrs. W. E. MacDonald, J. F. Nally, M. J. Ryan, J. J. Collins, J. Campbell, T. F. Moran, P. A. McCorry, Professor J. J. O'Connor, Messrs. Hugh Dolan, J. J. K. Linton, M. J. Byrne, J. S. MacCann, P. E. Mullaney, J. E. Kenny, P. A. McGeady, Professor T. G. Browne, Messrs. C. P. Hynes, M. G. Hynes, J. F. McDonald, P. McGlinchey, T. Scott, D. Reeves, M. J. O. Meara, L. M. Magee, M. J. MacClancy, Senator O'Donovan, Messrs. E. W. Little, R. J. Nolan, A. A. Donnelly, J. D. Whitty, J. F. Timoney, S. Conway, W. P. Cushnahan, J. P. Nolan, L. N. Gleeson, N. H. Lambert, G. A. Morrin, J. D. O'Connor, J. A. McGranaghan, F. O'Leary, P. A. Rogan, T. A. Mernagh, James O'Brien, Professor A. F. O'Dea, Mr. M. Cosgrove, Jnr., Professor W. Kearney, Mr. S. A. Evans (visitor), Messrs. J. M. Crowe, C. B. Adams, T. F. Connolly, P. J. Howard and J. M. Murphy, Hon. Secretary.

Apologies for non-attendance were received from: Messrs. P. F. Dolan, J. V. Carroll, J. P. Small, W. F. White, F. S. Ringwood, T. O'Leary and W. T. M. Browne.

The minutes of the August General Meeting were read, confirmed and signed.

Correspondence.—The only correspondence before the meeting was the list of apologies for non-attendance.

Report of Council.—The Hon. Secretary read the reports of the three Council Meetings (September 11th, November 15th and November 24th, 1939) held since the August General Meeting.

Arising out of the report of the Council Meeting, held on November 24th, 1939, the Hon. Secretary stated that the Secretary to the Commission on Vocational Education had since been pressing very hard for oral evidence to be given before the Commission by members of this association in addition to the memorandum which it had already been decided to submit.

It was resolved that the President and the Hon. Secretary give oral evidence before the Commission.

Paper.—A paper, illustrated with numerous lantern slides and the use of the epidiascope, as read by Mr. F. St. G. Sleith, M.R.C.V.S., Lecturer in Parasitology, Veterinary College of Ireland. It was evident that the lantern slides had taken a considerable time to prepare and members of the Association felt that they were deeply indebted to Mr. Sleith for the enormous amount of time and energy he must have put into the work. The paper was entitled "The Larger Helminths in the Intestines of Domestic Animals; their Association with Disease and Methods of Control." The discussion was opened by Professor T. G. Browne.

[Mr. Sleith's paper is reproduced, together with the contributions made in discussion and the essayist's reply, at the commencement of this issue.—*Editor.*]

*Received for publication, February 29th, 1940.

Part-Time Veterinary Inspectors.—The question of endeavouring to have the positions of part-time veterinary inspectors made permanent and pensionable was discussed from many angles.

It was decided that the opinion of a prominent member of the Dail who is also a member of the legal profession, be obtained as to what course of procedure he would advise should be adopted in the matter.

Membership.—The following two new members were unanimously elected: Mr. T. Kelleher, Bantry, and Mr. A. Walsh, Carlow.

Other Business.—The Hon. Secretary informed the meeting that it had been intimated to him by Senator O'Donovan that the Private Secretary to the Minister for Supplies had undertaken to consider the cases of veterinary surgeons who had received an inadequate supply of motor spirit, if these cases were forwarded by the Hon. Secretary of this Association.

J. M. Murphy, *Hon. Secretary.*

IN PARLIAMENT

The following are among questions and answers recently recorded in the House of Commons:—

Cabinet Agricultural Committee

Mr. De la Bere asked the Prime Minister whether he was in a position to state the name of the member of the War Cabinet who was now to preside over the committee dealing with agriculture.

Mr. Chamberlain: The Lord Privy Seal (Sir K. Wood) will preside over the committee in question.

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Horse-Breeding Grants

Major Sir Jocelyn Lucas asked the Minister of Agriculture whether, as any substantial increase in the number of horses available for transport in the near future in this country would involve importation of horses, and as the expansion of agriculture now proceeding is likely to cause a demand for an increased number of horses for transport purposes for many years to come, he will reinstate the system of grants to encourage horse breeding?

Sir R. Dorman-Smith: I would refer my hon. and gallant Friend to the reply given to him on March 14th, to which I have nothing to add.

Sir J. Lucas: In view of the fact that it has been just announced that the French Government are subsidising horse-breeding and stud farms, thus reversing the policy of the last war, would not the Minister also be strong-minded and reverse his decision, as the amount is only £8,000?

At a later date, Lieut.-Colonel Acland-Troyte asked the Minister of Agriculture whether he is aware that the breeding of heavy farm horses in this country is already beginning to decline; and whether, in view of the fact that agricultural conditions in this country will always require horse transport in addition to mechanical transport, and that the present expansion of agriculture is likely to necessitate increased transport facilities for many years to come, he can arrange to reconsider his recent decision to withdraw entirely the grants for heavy-horse breeding and set up an investigation into the possibility of evolving some other scheme for assisting this essential agricultural activity?

Sir R. Dorman-Smith: With regard to the first part of the Question, the Agricultural Returns for England and Wales for 1939 showed a decline of 2,209 (or nearly 6 per cent.) under the heading of heavy horses under one year old as compared with 1938. On the other hand, the total number of stallions returned as being used for service in 1939 showed an increase of 653 (or over 16 per cent.) over the corresponding figure for 1938. Any subsequent

change in the position will be reflected in the Returns for 1940 to be taken on June 4th. With regard to the latter part of the Question, I would refer my hon. and gallant Friend to the reply given on March 14th to my hon. Friend the Member for Gillingham (Sir R. Gower).

Sir J. Lucas asked the Minister of Agriculture whether, before coming to a decision about the support to be given by his Department for the breeding of horses for use in agriculture, he will set up an expert inquiry into the relative costs of horse and mechanical transport for various agricultural operations and into the relative merits of such transport from a national point of view, taking into account that mechanical transport requires the import both of fuel and of materials for the manufacture of the vehicle whereas horses are reproductive, consume home-produced fodder, and also provide useful by-products?

Sir R. Dorman-Smith: No, Sir. The question has already been fully considered, and although I appreciate the value of horses for agricultural work, I have reached the conclusion that, in present conditions, we must rely almost entirely upon the use of mechanical power in our campaign to bring about the desired increase in food production. As was explained to my hon. and gallant Friend in reply to his Question on March 14th on the subject, breeding in this and subsequent seasons is not likely to have any effect upon supplies of agricultural horses for some time to come.

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Colonial Development and Welfare

Sir P. Hannon asked the Secretary of State for the Colonies whether the personnel of the Colonial Development and Advisory Committee is now complete; whether he will state the composition of the committee official and unofficial; whether a programme of activities has yet been determined; and whether he will lay a White Paper outlining the general plan which the committee proposes to put into operation?

Mr. M. MacDonald: All these questions are dependent upon Parliament passing the necessary legislation for carrying out the Government's proposals for Colonial Development and Welfare. Such legislation will be introduced shortly. In the meantime it is not possible to make more than tentative plans, and I am not yet in a position to make a statement.

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West Indies (Agriculture)

Sir P. Hannon asked the Secretary of State for the Colonies whether the appointment of Inspector-General of Agriculture for the West Indies as part of the general scheme of reconstruction and development proposed by the Royal Commission and accepted by His Majesty's Government has yet been approved; whether the duties of this officer have been defined; and whether his reports will be at regular intervals submitted to Parliament?

Mr. M. MacDonald: I would draw my hon. Friend's attention to the Government's recent statement of policy on Colonial development and welfare, in which they accepted the proposal for the appointment of an Inspector-General of Agriculture in the West Indies. I am taking steps to select a suitable officer for this post, and I hope to be able to make a further announcement regarding his status and functions shortly.

Sir P. Hannon: Is my right hon. Friend keeping in view the importance of the continuity of the College of Tropical Agriculture in Trinidad as part of the functions of the new Inspector-General, and will he see that that work, which has already given admirable results, is continued?

Mr. MacDonald: Certainly, I attach the greatest importance to the work of that college, and the Inspector-General will act in the very closest contact with it and its officers.

Mr. Paling: Does the Minister's reply mean that the appointment of this officer will not have to wait for legislation?

Mr. MacDonald: That is so.

Slaughterhouses

Mr. J. Morgan asked the Minister of Food whether, in view of the approach of warmer weather, he is considering an increase in the number of slaughterhouses and meat distributing centres throughout the country; and will he indicate the number of new centres in mind and the areas these will serve?

Mr. Lennox-Boyd: The question of the adequacy of the number of slaughterhouses and meat distribution depots, both at present and when the warmer weather arrives, is constantly under review in order that adjustments may be made as and when required. Apart from this, independent local tribunals are being set up to consider cases where local interests are not satisfied that adequate slaughtering facilities have been provided.

Mr. J. Morgan: May we take it that there is to be an increase in the number of slaughterhouses in view of the approach of the summer, and in view of transport problems?

Mr. Lennox-Boyd: The hon. Member may take it that there will be tribunals set up very shortly to decide that question in the light of local knowledge.

Sir J. Lamb: To what extent will they be local tribunals?

Mr. Lennox-Boyd: Probably they will be on a county basis.

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Slaughterhouses and Meat Distribution (Tribunals)

Sir Joseph Lamb asked the Minister of Food whether he can now state the names of the members of the independent local tribunal which is to consider adjustments to be made in the number and location of slaughterhouses and meat distribution depots?

Mr. Lennox-Boyd: My right hon. Friend hopes very shortly to be in a position to announce the names of the members of the independent local tribunals which he is setting up to consider cases where local interests are not satisfied that adequate slaughtering facilities have been provided. I should perhaps explain that meat distribution depots are not within the scope of the terms of reference of the tribunals, but that arrangements are, and would continue to be, made for the establishment of a distribution depot, either alongside or in close proximity to each slaughterhouse.

Sir J. Lamb: Can the Minister say when these names will be published?

Mr. Lennox-Boyd: It will be a matter of days.

Sir J. Lamb: Can my hon. Friend also say whether applications are to be made directly to these committees, or to the Ministry itself in the first place?

Mr. Lennox-Boyd: Directly to the tribunals, when they are set up.

Mr. R. J. Taylor: Are these bodies to be organised on a regional basis?

Mr. Lennox-Boyd: They will nearly all be on a county basis, with one or two variations.

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Condemned Meat (Losses)

Sir A. Harbord asked the Minister of Food whether he is aware that in the event of any meat being condemned as unfit after arrival at the butchers' shops the loss falls on the retailer as the meat has already been paid for; and what steps he is taking to remedy this grievance?

Mr. Morrison: Property in the meat sold to butchers passes to them at the wholesale distribution depot. In accordance with the usual trade practice, losses arising from condemnation after arrival of the meat at the butcher's shop fall on the butcher except when the condemnation is due to disease. In such cases a refund is made to the butcher. Full investigation is made into every case of condemnation that is brought by butchers to the notice of the wholesale depot manager concerned.

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Credit Facilities

Mr. Parker asked the Minister of Agriculture whether he is aware that many farmers do not like having to

appeal for financial aid to the war executive committees as they do not like to submit their private affairs to local competitors; that the rate of interest they have to pay is too high; and whether he will consider making better arrangements for granting necessary credits through the banks?

Sir R. Dorman-Smith: I am not aware that there is any reluctance on the part of farmers to apply for assistance under the Agricultural Requisites Assistance Scheme on the grounds mentioned. As regards the rate of interest, I have already stated that the scheme is intended to supplement, not to compete with, existing sources of credit. To lower the rate would defeat this object. From the applications already forwarded to me, I do not think that farmers regard the rate of 5 per cent. at present charged as unreasonable. In the circumstances, I see no reason to consider making other arrangements through the banks; and I have every confidence that the banks will do their utmost to meet the needs of farmers under war-time conditions.

Mr. De la Bere asked the Minister of Agriculture whether he can now make a statement on the progress of the Government's scheme for comprehensive credits for agriculture?

The Minister of Agriculture (Colonel Sir Reginald Dorman-Smith): I assume that my hon. Friend is referring to the Agricultural Requisites Assistance Scheme, but I would remind him that that scheme is designed to supplement existing credit supplies and is not comprehensive in the sense of covering all the credit requirements of agriculture. At March 31st, 1940, the scheme had been in operation about a month, and I have not yet received from County War Agricultural Executive Committees their reports on this initial period, so I am as yet unable to say how many applications have been approved.

Mr. De la Bere: Is not my right hon. and gallant Friend aware that I am not alluding to that scheme? Is he not further aware that he has had over a year in which to go into this matter, and that what is urgently required at the present time is both capital and credit in order to obtain the maximum output from the farms? Why is it that no single man has been given this job with power to put it through? It not my right hon. and gallant Friend aware that it is absolutely vital, and yet nothing is done? The position gets worse and worse.

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Straw (Feeding Value)

Major Carver asked the Minister of Agriculture whether his Department has reached any decision on the conversion of straw into a useful animal feeding-stuff by treating it with caustic soda; and whether any experiments with animals are being made?

Sir R. Dorman-Smith: Experiments to determine the feeding value of straw treated with caustic soda and the possibilities of using the process on ordinary farms are at present being carried on; they include trials with animals. These experiments have not yet reached a stage which would justify me in taking a definite decision on the merits of this process.

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Cattle Feeding Stuffs

Mr. Lambert asked the Minister of Food whether he has made inquiry into the facts that sound bread is despatched from London as bakery sweepings and sold as cattle food; and whether such practices have been stopped?

Mr. Lennox-Boyd: It has always been the practice of bakers to dispose of, for feeding to animals, any residue of broken and stale bread and dough unfit for bread making. I have made inquiries and I am assured that the particular consignments to which my right hon. Friend has referred were unsuitable for human consumption.

Mr. Lambert: Is my hon. Friend aware that some of this bread was found to be perfectly sound and was actually consumed in Devonshire after having been sent there as cattle food?

Mr. Lennox-Boyd: In this case we have made elaborate inquiries. If it were true that bread which was suitable for human consumption was used in that way, it would be highly reprehensible; but according to the information which we have receeived that is not so, and if we were not to use this for animal feeding stuffs, it would be a net loss to the nation's agricultural effort.

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Feeding Stuffs from Waste Products

Lieut.-Colonel Heneage asked the Minister of Supply how many local authorities are installing apparatus to reduce waste products suitable for feeding stuffs to a form of meal or otherwise?

Mr. Burgin: Twenty-five local authorities already have utilisation plants for treating organic waste materials and all such plants are capable of reducing suitable waste materials to feeding meals.

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Animal Food Stuffs (Boiling)

Lieut.-Colonel Heneage asked the Minister of Agriculture whether, in view of the fear that has been expressed that waste products suitable for feeding stuffs from the urban districts would pass on diseases to live-stock, he will issue the necessary instructions showing the action which makes these products safe, and make such instructions available to this House?

Sir R. Dorman-Smith: The Foot-and-Mouth Disease (Boiling of Animal Food Stuffs) Order, 1932, provides that any food stuffs which contain material of animal origin, or have been in contact with such material, shall not be fed to stock until they have been exposed for a period of at least one hour by any process to a temperature of not less than 212 degrees Fahrenheit—that is, thoroughly boiled.

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Scotland (Grazing Facilities)

Sir T. Moore asked the Secretary of State for Scotland, in view of the danger of the overstocking of dairy farms owing to the greatly increased areas which have been ploughed up and placed under cultivation, what steps it is proposed to take to deal with this situation and prevent unnecessary slaughtering of stock in consequence of the absence of adequate grazing facilities?

Mr. Colville: In arranging for increased cultivation agricultural executive committees take into account the circumstances of each individual farm and while grazing facilities for dairy cattle will be less plentiful than formerly I have no reason to think they will be inadequate. I am, however, giving close attention to the question of improvement of grassland with a view to increasing stock-carrying capacity, and executive committees have been asked to facilitate where possible arrangements for the greater utilisation of lands used for sporting purposes for the grazing of cattle and sheep.

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Ponies and Donkeys (Slaughter)

Sir J. Wardlaw-Milne asked the Home Secretary whether his attention has been drawn to the sale of 25 circus ponies and two donkeys for the purpose of slaughter on March 12th; and whether he will take steps to prevent the destruction of these animals, which are young and fit, in view of the necessity for making use at the present time of all animals entirely fit for work?

Sir J. Anderson: My attention had been drawn to this matter, but I have no power to take any action.

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Bees (Brood Disease)

Captain P. Macdonald asked the Minister of Agriculture whether, in view of the report of the Bee Research Department, Rothamsted, endorsed by a unanimous resolution of the Bee Advisory Committee, he will introduce early legislation to confer legal powers for the control of brood disease in bees?

Sir R. Dorman-Smith: I am prepared to consider sympathetically the introduction of such legislation this Session if time permits and if general agreement is reached in the industry.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

April 15th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.
April 16th.—Meeting of the Dumfries and Galloway Division, N.V.M.A., at Carlisle, 12.30 p.m.
April 19th.—Meeting of the Veterinary Research Club, at the Laboratory of the Ministry of Agriculture and Fisheries, Weybridge, 3 p.m.
April 24th.—Meeting of the Comparative Section of the Royal Society of Medicine, at the Society's House, 1, Wimpole Street, W., 5 p.m.
April 26th.—Meeting of the Lancashire Division, N.V.M.A., at Liverpool, 2.30 p.m.
May 9th.—Last date for nominations, R.C.V.S. Council Election.
May 15th.—Commencement of R.C.V.S. Animal Management Examination.
May 23rd.—Issue of R.C.V.S. Annual Report and Voting Papers.
May 30th.—Last date for receipt of R.C.V.S. Council Election Voting Papers.
June 6th.—**R.C.V.S. Annual General Meeting.** Victoria Veterinary Benevolent Fund Annual General Meeting.
June 20th.—R.C.V.S. Committee Meetings.
June 21st.—R.C.V.S. **Council** Meetings.
June 27th.—R.C.V.S. Written Examinations begin.
July 3rd.—Provisional date for commencement of R.C.V.S. Oral and Practical Examinations.

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PERSONAL

Colonial Veterinary Service

Appointment.—Mr. Eric Oliver Longley, B.Sc. (Lond.), M.R.C.V.S., of Woking, Surrey, has been appointed as Veterinary Research Officer, Nigeria.

On Leave.—Mr. W. G. Beaton, M.R.C.V.S., D.T.V.M. (Edin.), Deputy Director of Veterinary Services, arrived in this country in March, on leave from Nigeria.

Retirement.—Major Joseph Mario Smith, O.B.E., M.R.C.V.S., Chief Veterinary Officer, Department of Agriculture, Palestine, has arrived in this country on leave preparatory to his retirement in June.

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Members of the profession will learn with much pleasure that Wilfrid Lindsay Bullock, LL.B. (Lond.), son of Dr. Fred Bullock, Secretary and Registrar of the Royal College of Veterinary Surgeons, has passed the Final Examination of the Law Society for Admission as a Solicitor, with distinction. Mr. Wilfrid Bullock is articled to Mr. E. S. Herbert, M.A., LL.B., of the firm Sydney Morse & Co., of Aldersgate.

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R.C.V.S. OBITUARY

Armstrong, Frederick, Lockholme, Penrith, Cumberland, Captain late R.A.V.C. Graduated N. Edinburgh, July 21st, 1887. Died April, 1940.

Evans, John, 71, Water Street, Carmarthen. Graduated N. Edinburgh, May 31st, 1899. Died March, 1940.

Fern, Edward, Oakleigh, Vines Cross, Horam, Sussex. Graduated N. Edinburgh, June 1st, 1891. Died January, 1940.

Huey, William Frederick Forbes, 15, Gt. James Street, Londonderry. Graduated Dublin, December 11th, 1925. Died March 6th, 1940; aged 39 years.

Hulford, Charles Francis, 5, Church Road, Osterley, Heston, Middlesex. Graduated London, May 15th, 1889. Died March 24th, 1940; aged 74 years.

Robertson, James Bell, Queen Square, Lancaster. Graduated N. Edinburgh, May 30th, 1889. Died April 6th, 1940; aged 80 years.

Mr. J. R. Robertson, M.R.C.V.S.

Leading Authority on Racehorse Breeding

Mr. James Bell Robertson, whose death at his home in Lancaster we record with deep regret, was recognised, not only in this country but in the United States, as one of the greatest authorities on the breeding of the racehorse, and as an outstandingly able writer on the subject—his contributions in the *Sunday Times* under the pen name of "Mankato" will be familiar to many of our readers. His books, "Heredity Applied to Racehorses" (1906) and "Heredity on Racing Stamina in the Thoroughbred Horse" (1912), are standard works.

Mr. Robertson had suffered from asthma for some time. He attended the Liverpool meeting, but illness prevented his attendance at the Grand National on Friday of last week.

Born in Yorkshire of Scottish parents, he lived for a number of years at Bradford, but returned to Scotland to be trained as a veterinary surgeon at Edinburgh, where he was a fellow student of Mr. Fred Armstrong whose death, by a sad coincidence, we record in the previous column. Soon after he qualified he went to America, where he gained much valuable experience. On returning to this country he set up in practice in Lancaster, but he gave up his practice for journalism. He became, in addition, a consultant to the leading racing stables.

The *Sunday Times* says of him: "He was consulted at one time or another by every prominent racing owner, and a notable tribute was paid to him at a public dinner in London a few years ago by the Aga Khan. A speaker had referred to the Aga Khan as the 'greatest living authority on racehorse breeding.' In replying, the Aga Khan said: 'Nobody—and certainly not myself—possesses a tenth of the knowledge of breeding possessed by Mr. J. R. Robertson.' A familiar figure at every important meeting, and made distinctive by the Victorian Inverness cape to which he was faithful, to racing people he was affectionately known as 'Professor,' a title given to him many years ago by friends when he was a consultant veterinary surgeon."

His only son was killed in the Great War. He is survived by a widow.

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DEATH OF DR. J. F. DeVINE

The current issue of the *North American Veterinarian* records the death of Dr. John Francis DeVine, who was Chief Veterinarian, New York Department of Agriculture, 1909-1911, and Consulting Veterinarian to the department, 1911-1914. Dr. DeVine was a valued member of the veterinary faculty of New York University, from 1911-1921, and ever active in veterinary association work, both state and national. He was President of the United States Livestock Sanitary Association in 1911 and held the same office in the New York Veterinary Medical Society in 1912, after having served as Secretary from 1909 to 1911. The *North American Veterinarian* speaks of Dr. DeVine as "a fluent talker, a voluminous writer and always a colourful figure in professional circles."

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RED CROSS AGRICULTURE FUND

An influential Agriculture Fund Committee, widely representative of farming interests and ancillary organisations, has been called into being to give effect to the desire expressed by the Executive Committee of the Mansion House Appeal, that funds should be raised on behalf of the Lord Mayor's Fund established in response to the appeal of H.R.H. the Duke of Gloucester for the Red Cross and St. John Joint War Organisation.

Sir Charles Howell Thomas, late Permanent Secretary of the Ministry of Agriculture, has accepted the Chairmanship of the General Committee of the Agriculture Fund and Mr. R. W. Haddon is acting as Deputy Chairman. Professor G. H. Wooldridge, F.R.C.V.S., M.R.I.A., President of the Royal College of Veterinary Surgeons, and Mr. H. W. Steele-Bodger, M.R.C.V.S., President of the National Veterinary Medical Association, are members of the Committee, which includes Lord Iliffe, Lord Hastings and Lord Penrhyn; Mr. Tom Peacock,

President of the National Farmers' Union; Mr. George Dallas, Transport and General Workers' Union; Mr. E. G. Gooch, National Union of Agricultural Workers; Mr. J. F. Linney, Auctioneers' and Estate Agents' Institute; Mr. Thomas Baxter, Chairman of the Milk Marketing Board, Mr. W. J. Cumber, Chairman of the Farmers' Club, and the representatives of governing bodies associated with wheat growing, milling and the seed trade; horticulture, fruit and potato producers; chartered surveyors and land agents; cattle, pig and sheep breeders and their associations; and poultry and egg producers.

In the course of their appeal for support the Committee say: "The main object which lies before this Agriculture Fund Committee is the raising of a considerable sum of money in order that the Red Cross, a voluntary organisation, faced once more with a heavy responsibility of caring for the wounded, prisoners, and other victims of the present war, may proceed with this work of mercy. During the last war, farmers, stockbreeders, farm workers, and members of the many professions associated with the industry, combined in a far-reaching effort to obtain money for the Red Cross and a sum amounting to slightly over £1,024,808 was raised. With Great Britain itself included in the present war, the necessity for being equipped and prepared for eventualities means that the call for more ambulances, as an example, has become a pressing one. Appeals to farmers already made have met with a generous response. Branches of the Farmers' Union in many areas are holding free gift sales of farm stock and produce, the proceeds going to the Fund, while others have started a penny per week per member contribution. Pedigree stockbreeders are giving calves and gilts, which are being sold and re-sold, a Shorthorn bull calf making 32 guineas and a Large Black gilt making £28 17s. 6d. Auctioneers are providing a very direct link between their own profession and those farmers organising sales as a means of raising money for the Fund.

"Agricultural, horse, pony and flower shows executives are seeking a lead as to what should be done in regard to holding exhibitions this year. If circumstances remain as they are now, there can be no harm in organising one-day shows and devoting the proceeds to the Red Cross Agriculture Fund.

"Appeal is therefore being made to all phases of the farming industry to play an energetic part in a national effort to surpass the figure of £1,024,808, large as it seems, realised during the last war, and the ingenuity of the people of the countryside in raising the wind for every good cause should quickly provide them with a flow of tangible suggestions which can be turned into practice."

The Secretary of the Red Cross Agriculture Fund is Mr. Alec. D. Robertson, 2, Chesham Place, London, S.W.1, to whom all contributions and communications should be sent.

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LEGAL NOTES

Bitten by Greyhound: Failure of Plaintiff's Appeal

The Court of Appeal, on Friday of last week, dismissed the appeal by the plaintiff, Mrs. Rose Toogood, from the decision of Judge Banks given at Kingston-upon-Hull County Court in an action which she brought against Mr. Ernest Wright claiming damages for personal injuries sustained by her owing to being bitten by a greyhound belonging to the defendant. The plaintiff also claimed £5 as the value of a cat belonging to her which was killed by the defendant's dog.

Mr. G. H. B. Streatfeild, K.C., and Mr. Withers Payne appeared for the appellant. The respondent did not appear and was not represented.

The plaintiff's case (states *The Times* report) was that on September 18th, 1939, the defendant, who was the proprietor of the Priory Hotel, sent out two racing greyhounds belonging to him in charge of two little boys, aged 10 and 12 years, who, it was admitted, were not strong enough to control the dogs if they desired to get away. The dogs saw a cat belonging to the plaintiff, broke away from the boys and chased it into a 10 ft. way adjoining the plaintiff's house. The plaintiff endeavoured to take the cat, which had been killed, away from the dogs, and one of them bit her in the thigh.

There was no evidence that either of the dogs had attacked, or had ever shown any disposition to attack, mankind.

The county court Judge held that the defendant was not negligent in allowing the dogs to be taken out by the little boys. If he were wrong in so holding, and the defendant was guilty of negligence, then he was of opinion that the defendant could not be expected to foresee that the dogs would bite a human being as the result of his negligence. In his (the Judge's) view it was not the natural and probable consequence of leaving the dogs uncontrolled that they would chase a cat, catch it, and bite some human being who tried to rescue it. He accordingly gave judgment for the defendant.

Mr. Streatfeild, on behalf of the plaintiff, submitted that the county court Judge was wrong in holding that the defendant was not liable. In such a case as the present, quite apart from any question of *scienter*, there might be special grounds for the defendant's liability in negligence. In as much as racing greyhounds were trained to race after furry animals it must be expected that when they went out they would chase a furry animal if they met one, and in those circumstances there was a duty on the owner of such dogs to keep them under control.

Judgment

Lord Justice Slesser, in giving judgment, said that the evidence in the Court below failed to satisfy the Judge that the defendant was possessed of knowledge that his dogs were of a fierce or mischievous disposition or with a propensity to bite mankind or cats. There was no appeal on that point, and the case was put merely on the ground of negligence. It was argued that greyhounds, although domestic animals, were prone to chase animals such as rabbits or cats and to bite them, and that the defendant must therefore be taken to have known that these particular domestic animals were inclined to chase cats and that anyone who tried to take the cat away from them would be bitten.

The county court Judge found that there were no special circumstances enabling the plaintiff to say that the defendant was put under any special duty as having under his control something particularly dangerous which would justify him (the Judge) in coming to the conclusion that there had been negligence in not properly controlling those animals. The Judge declined to hold that there was any peculiar danger to be anticipated from these particular animals known as racing greyhounds on the ground that they might chase cats which would not also apply to other types of dogs which would equally chase cats and bite anyone who tried to rescue them. Had the Judge come to the conclusion that there existed the duty which had been suggested, the Court might have had to consider whether there was evidence on which he could have so found.

If the argument for the plaintiff had succeeded it might well have led to the compulsory imprisonment of a large portion of the canine race. In the absence of proof of *scienter* the Judge was right in holding that there was no negligence in allowing the dogs to go out in the way they did, and the appeal must be dismissed.

Lord Justice Clauson, in agreeing, said that the damage to the plaintiff was done within the curtilage of her own garden. The case was not one in which a complaint was made by a person using a highway that she had been injured by reason of some negligence on the part of the owner of a domestic animal. He only said that in order that there might be no misunderstanding of the ambit of the decision.

Mr. Justice Singleton concurred.

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Poison for Vermin.—At Canterbury on March 6th, a shepherd was summoned for knowingly putting on land

at Prospect Farm, Whitstable, a carcase of a lamb which had been rendered poisonous, contrary to the Protection of Animals Act, 1911, and was fined 5s. His employer was summoned for aiding and abetting, and was fined 10s., with £3 3s. 0d. costs.

The case for the Royal Society for the Prevention of Cruelty to Animals, as reported in *The Justice of the Peace*, was that the first defendant had admitted having laid strychnine after finding a dead lamb with its hind-quarters eaten away. As a fox was believed to have been responsible, the carcase of the lamb had been returned to the field as a bait, after poison had been inserted. The carcase was laid in a field at night and was hung on a fence during the day. As it was only two feet from the ground, this did not constitute reasonable precautions to prevent injury to dogs or other domestic animals. It was therefore contended that the statutory defence, under the Protection of Animals (Amendment) Act, 1927, s. 1, was not available as a dog had, in fact, been killed.

The defence was that the poison was laid far away from the main road in a place where the fox was suspected of coming. It was not realised that a dog was the culprit. The only reason for laying the poison was to get rid of a marauder which had attacked the second defendant's sheep this year and last.

The chairman observed that strychnine caused horrible suffering, and some more merciful drug might have been used to destroy vermin.

[In a footnote to the foregoing report, the Editor of the *Pharmaceutical Journal* observes: "Once again we emphasise that the sale of strychnine otherwise than as an ingredient in medicine is unlawful. Its sale for the purpose of destroying vermin is absolutely prohibited."]

* * * * *

FOOT-AND-MOUTH DISEASE IN SURREY

The existence of foot-and-mouth disease was confirmed on Monday among cattle at Petersham, Surrey. The area subject to restrictions in the movement of animals lies in the counties of Berks, Bucks, Essex, Herts, Kent, London, Middlesex and Surrey.

* * * * *

WARBLE FLY INSPECTION

At a meeting of the Galway County Council the Finance Committee agreed to appoint the Veterinary Inspector in the county to supervise the work of the Warble Fly Inspectors and to allocate £150 for division between them for the work.

* * * * *

ARMY VETERINARY SERVICE

London Gazette—War Office—Regular Army

April 9th.—Lt. (Qr.-Mr.) W. E. Turton to be Capt. (Qr.-Mr.) (April 7th).

Regular Army Reserve of Officers

April 5th.—Maj. A. B. Bowhay, O.B.E., having attained the age limit of liability to recall, ceases to belong to the Res. of Off. (March 6th).

* * * * *

Chemoprophylaxis of Trypanosomiasis (Bevan, Ll. B. *Vet. Rec.* **52**. 257-258.).—The third sentence of the final paragraph should read: "In Central Africa, alone, some four and a half *million* square miles of potentially valuable country are rendered unsuitable for beneficial occupation and development by reason of the presence or menace of the tsetse fly."

* * * * *

The Principal, Royal Veterinary College, acknowledges with very sincere thanks an anonymous gift to Beaumont Hospital of a collection of surgical instruments which will be most useful.

MORE FOOD FOR THE COW

Root Crops and Maize.—Roots are well suited to newly ploughed grassland in good heart and should be grown in greater quantities this season because of the large weight of food they produce per acre. The land should be well cultivated and the seed sown, preferably, on the flat. Where cabbage and kale are grown for autumn and early winter use, swedes and mangolds are to be preferred for mid-winter and spring feeding. A quick-growing variety of turnip can be broadcast as a catch crop after a soiling crop has been cut in July. The dung available on dairy farms cannot be used to better advantage than in stimulating the maximum production of root and fodder crops. For a heavy crop on a moderate acreage saves money in labour, tillage, manuring and harvesting.

Maize.—More dairy farmers are contemplating growing maize in 1940. It is a good form of insurance against a very dry, hot summer, but it is not suited to poor land or cold, wet districts, for it can be quickly damaged by frost. A small acreage on good land will, in most seasons, give a large yield of succulent food in September and October. It should be sown in late May or early June, ploughing two bushels per acre into every second furrow. An application of dung is essential, except on very rich land, and rapid growth will be assisted by complete manuring as for soiling crops with a top-dressing of 1 cwt. per acre of nitrochalk or nitrate of soda.—*Ministry of Agriculture News Service.*

* * * * *

MORE GRAIN FOR POULTRY

More grain for poultry during the next few months—particularly for young chicks—is the subject of a circular which the Minister of Food has recently sent to provender millers and to distributing dealers in feeding stuffs. "This," says the Ministry of Agriculture News Service, "is one of the objects the Minister had in view when he recently made it permissible for every authorised buyer of home-grown wheat to sell or use for the feeding of livestock one-half instead of one-third of his purchases of wheat from growers. All provender millers are now expected to convert at least the pre-war percentage of their total supplies of feeding wheat into cut wheat or kibbled wheat suitable for young chicks. They are also expected to release the normal pre-war percentage as straight wheat or mixed poultry corn. Distributing dealers have been asked to follow the same procedure, so far as it applies to their trade."

* * * * *

WAR-TIME PRESCRIBING

Pari passu **all that is suggested in the following important editorial from the *British Medical Journal* (February 3rd) is of profound importance also, we feel only too well assured, in veterinary practice.**

"Practitioners or committees who have studied their bills for drugs during the last couple of months will have realised that the cost of medication has risen steeply. Some of the increases, as in ephedrine and ergot, are the result of a world shortage and the aftermath of the wars in China, Spain and Poland. In other cases there is competition between armaments and foods and drugs for the same raw materials or the same shipping space. Drugs which were formerly imported cheaply must now be manufactured at home more dearly to save precious currency. When Aesculapius is deserted for Mars and the shadow of autarchy falls on the garden of physic the prudent physician must learn to husband his resources. Dr. George Dock needed no more than twenty drugs, but things have changed since he wrote his advice to house officers, and the advance of knowledge and the wiles of advertisement have combined to increase the

variety and cost of therapeutic agents. In war there is no room for internecine strife, so we may ask our chemical manufacturers whether it is necessary for each of them to coin a different name for a single substance such as stilboestrol or mandelic acid; whether it is necessary for each of them to market a different local anaesthetic, barbiturate, and analeptic; and whether in matters of nomenclature and advertisement they might not be wiser to copy American rather than German methods?

"The first economy is not to use drugs unless they are necessary. Advertisements for purgatives bulk very large in our post-box and the Press, yet experts continue to warn us that purgatives are usually not only unnecessary but actually harmful. Most of the drugging of the common cold and the simple fevers is equally ill advised. It is a pity that medical students are not expected to know the cost of drugs as well as their doses, or to study books such as the *National Formulary*, in which useful lists of equivalents and alternatives are given. For want of this basic training physicians and surgeons are often unaware of the discrepancy in prices between preparations under official and proprietary names. This is particularly true of hypnotics, local anaesthetics, and the numerous analgesic tablets. Every time a new barbiturate is introduced the physician should remind himself that chloral hydrate and paraldehyde remain the cheapest and best-tried hypnotics.

"Alkaloidal salts which may be difficult to obtain—such as ephedrine, atropine, hyoscine, and ergometrine—should only be prescribed when absolutely necessary. Codeine salts are expensive; aspirin and phenacetin are comparatively cheap. Calcium carbonate, magnesium carbonate, and kaolin can often successfully replace bismuth carbonate in compound alkaline powders. Stilboestrol and kindred synthetic oestrogenic substances are much cheaper than the actual female hormone, and should be used whenever possible. Expensive highly specific drugs should not be prescribed for non-specific purposes. There are cheaper bitter tonics than quinine. Again, the drug sulphapyridine is at present irreplaceable in the treatment of pneumonia and gonorrhoea, but the much cheaper simple sulphanilamide is at least as effective in streptococcal infection and pyelitis, and probably in cerebro-spinal fever also. No other compounds in this group can show the same proofs of efficacy, and parenteral administration of the expensive soluble derivatives is rarely justified. Vitamins are meant for avitaminosis, and should not be used for conditions which would respond as well to a few chips of quassia. Oral extracts of liver are practically never indicated, and in the treatment of pernicious anaemia liver should be given by intramuscular injection; the same amount of liver will then go a hundred times as far.

"Too often, again, money is wasted on expensive excipients or solvents such as syrup or alcohol. The *British Pharmacopoeia* (1932) introduced standardised powdered drugs, but the hope that they might be widely prescribed has not been fulfilled. Digitalis pulverata, belladonna pulverata, ergota praeparata, ipecacuanha pulverata, and nux vomica pulverata are typical examples. The prescription of these would save alcohol and reduce cost, and as they are available in tablets the smaller bulk would simplify problems of storage and transport. Digitalis and ergot in tablet form are also more stable than any liquid preparations of the drugs. If mixtures are essential the liquid extracts should more often be used instead of the corresponding tinctures—for example, liquid extracts of hyoscyamus, nux vomica, ipecacuanha, senega, etc. The mixtures in the *National Formulary* have all been formulated on this principle. Concentrated medicinal waters, such as concentrated peppermint water and concentrated dill water, and flavouring tinctures like tincture of orange, contain high percentages of alcohol on which no rebate may be obtained and are therefore unduly expensive. The concentrated waters may be replaced by emulsions of the volatile oils in water—for example, emulsio olei menthae piperitae (*B.P.C.*). A whole article could be written on unnecessary bulk in the dispensary and the waste of money in transport of diluents and containers. For example, hydrogen peroxide should be transported in the concentrated 100-volume strength and diluted to the pharmacopoeial standard in the dispensary. Every hospital with a pharmacist should make its own distilled water and sterile solutions and be prepared to supply them in its area of service instead of importing them in flasks and Winchesters."

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT OF 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th March, 1940	25	25	2	61	—	6	8	131	89
Corresponding period in ...									
1939	31	33	3	217	3	8	10	68	38
1938	44	45	2	100	2	8	9	16	6
1937	36	43	—	—	9	9	8	51	33
Total 1st January to 15th March, 1940	129	142	14	2,240	8	21	82	789	358
Corresponding period in									
1939	208	220	29	4,357	17	33	129	277	172
1938	215	222	103	14,659	27	42	75	82	33
1937	155	177	3	262	53	83	90	250	155

NOTE.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.

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Acid. Boric, 2 drms. Iodoform, 1 drm.	7/6	7/–
Alkaline	5/6	5/–
Chinosol, ½ drm.	8/6	8/–
Creoform	8/–	7/6
Creosalgen, Surgical 3%	5/–	4/6
Formaldehyde 2%	6/–	5/6
Hewsol	5/–	4/6
Hyd. Perchlor. (1 in 2000)	5/6	5/–
Iodermiol 10%	7/6	7/–
Iodoform, 1 drm.	7/–	6/6
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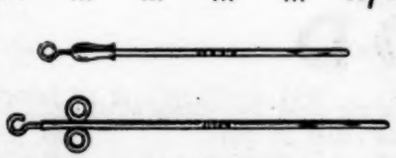

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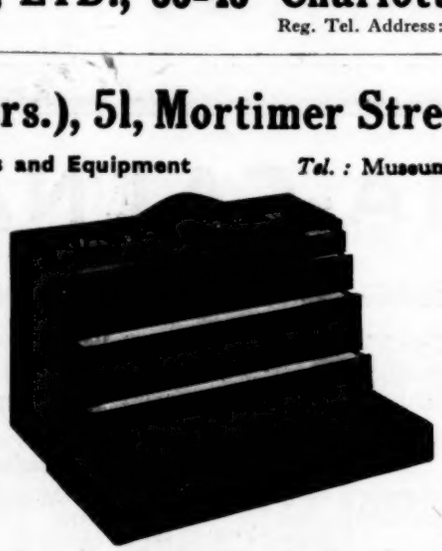

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